

73[®] Amateur Radio Today

AUGUST 1999
ISSUE #466
USA \$3.95
CANADA \$4.95

Build:

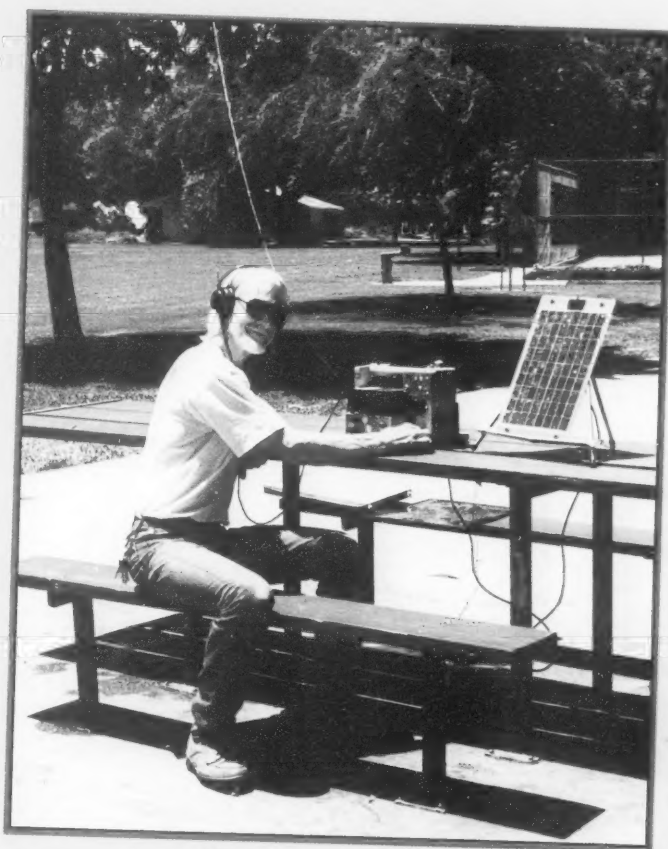
- A Tone Decoder
- A Phase Shift Keying Unit

Theory:

- Transmission Lines
- Op Amps

SSTV:

- Alive and Well in ZL



How about a talk in the park? — page 30

Review: Ten-Tec QRP Kit

*****5-DIGIT 48103
#00000191940MR5# JUN76 209
SERIALS PROCESSING DEPT 45
UNIV MICROFILMS IT P 1
300 N ZEEB RD
ANN ARBOR MI 48103-1553

08 >

0 74851 08725 1

SYNTHESIZED VHF & UHF EXCITER & RECEIVER MODULES

Exciters and Receivers provide high quality rx/tx and lsk operations. Features include:

- Dip switch frequency selection.
- Exceptional modulation for voice and ctcss.
- Very low noise synthesizer for repeater service.
- Direct fm for data up to 9600 baud.
- TCXO for tight frequency accuracy in wide range of environmental conditions.
- Next day shipping. No wait for crystals.

EXCITERS:

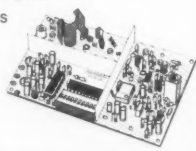
Rated for continuous duty, 2-3W output.

T301 VHF Exciter: for various bands 139-174MHz, 216-226 MHz.

- Kit (ham bands only) ...\$109 (TCXO option \$40)
- Wired/tested, incl TCXO...\$189

T304 UHF Exciter: various bands 400-470 MHz.

- Kit (440-450 ham band only) incl TCXO ...\$149
- Wired/tested...\$189



RECEIVERS:

Very sensitive - 0.2µV.

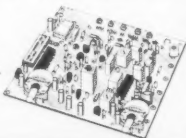
Superb selectivity, >100 dB down at ±12 kHz, best available anywhere, flutter-proof squelch.

R301 VHF Receiver: various bands 139-174MHz, 216-226 MHz.

- Kit (ham bands only) ...only \$139 (TCXO option \$40)
- Wired/tested ...\$209 (includes TCXO)

R304 UHF Receiver: various bands 400-470MHz.

- Kit (440-450 ham band only) incl TCXO ...\$179
- Wired/tested...\$209



TRADITIONAL CRYSTAL-CONTROLLED VHF & UHF FM EXCITERS & RECEIVERS

FM EXCITERS 2W output, continuous duty.

- TA51: for 6M, 2M, 220 MHz kit \$99, w/t \$169
- TA451: for 420-475 MHz kit \$99, w/t \$169
- TA901: for 902-928 MHz, (0.5W out) w/t \$169

VHF & UHF POWER AMPLIFIERS

Output levels from 10W to 100W.....Starting at \$99

FM RECEIVERS:

- **R100 VHF FM RCVR.** For 46-54, 72-76, 140-175, or 216-225 MHz. kit \$129, w/t \$189
- **R144 RCVR.** Like R100, for 2M, with helical resonator in front end. kit \$159, w/t \$219
- **R451 FM RCVR,** for 420-475 MHz. Similar to R100 above. kit \$129, w/t \$189.
- **R901 FM RCVR,** 902-928MHz \$159, w/t \$219

TRANSMITTING & RECEIVING CONVERTERS

No need to spend thousands on new transceivers for each band!



- Convert vhf and uhf signals to & from 10M.
- Even if you don't have a 10M rig, you can pick up very good used xmtrs & rcvrs for next to nothing.
- Receiving converters (shown above) available for various segments of 6M, 2M, 220, and 432 MHz.
- Rcvr Conv Kits from \$49, wired/tested units only \$99.

- Transmitting converters for 2M, 432 MHz.
- Kits only \$89 vhf or \$99 uhf.
- Power amplifiers up to 50W.



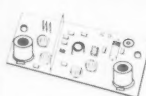
Buy at low, factory-direct net prices and save!
For complete info, call or write for complete catalog.
Order by mail, fax, email, or phone (9-12, 1-5 eastern time).
Min. \$6 S&H charge for 1" lb. plus add'l weight & insurance.
Use Visa, MC, Discover, check, or UPS C.O.D.

LOW NOISE RECEIVER PREAMPS



LNY-1 ECONOMY PREAMP

ONLY \$29/w&t

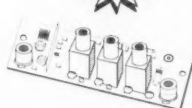


- Miniature MOSFET Preamp.
- Low noise figure.
- RCA jacks allow easy connection inside radios.
- Available for various bands from 28 to 450 MHz.

LNP-1 PRESELECTION

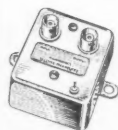
ONLY \$39/w&t

- Eliminate intermod!
- Low noise preamp
- Sharp 3-section filter
- Available for bands from 137 to 170 MHz.



LNG-1 SAAS FET PREAMP

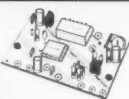
STILL ONLY \$59, wired/tested



- Make your friends sick with envy! Work stations they don't even know are there.
- Install one at the antenna and overcome coax losses.

- Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.

SUBAUDIBLE TONE ENCODER/DECODER



Access all your favorite closed repeaters!

- Encodes all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- Decoder can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying rcvr buzz.
- TD-5 CTCSS Encoder/Decoder Kit now only \$29
- TD-5 CTCSS Encoder/Decoder Wired/tested.....\$49

WEATHER FAX RECEIVER

Join the fun. Get striking images directly from the weather satellite.



A very sensitive wideband fm receiver optimized for NOAA APT & Russian Meteor weather fax on the 137MHz band.

Covers all 5 satellite channels. Scanner circuit & recorder control allow you to automatically capture signals as satellites pass overhead, even while away from home.

See product review with actual satellite pictures in June 1999 QST, along with info on software and antennas.

- R139 Receiver Kit less case\$159
- R139 Receiver Kit with case and AC power adapter \$189
- R139 Receiver w/t in case with AC power adapter ...\$239
- Internal PC Demodulator Board & Imaging Software \$289
- Turnstile Antenna\$119
- Weather Satellite Handbook\$20

WWV RECEIVER

Get time & frequency checks without buying radio and fm

Hear solar activity reports affecting radio propagation.

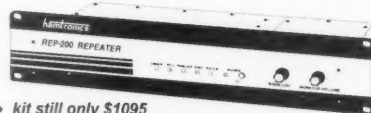
Very sensitive and selective crystal controlled superhet, dedicated to listening to WWV on 10 MHz. Performance rivals the most expensive rcvrs.

- RWWW Rcvr kit, PCB only\$59
- RWWW Rcvr kit with cabt, spkr, & 12Vdc adapter\$89
- RWWW Rcvr w/t in cabt with spkr & adapter\$129



Get more features for your dollar with our REP-200 REPEATER

A microprocessor-controlled repeater with full autopatch and many versatile dtmf remote control features at less than you might pay for a bare bones repeater or controller alone!



- kit still only \$1095

- factory assembled still only \$1295

50-54, 143-174, 213-233, 420-475 MHz. (902-928 MHz slightly higher.)
FCC type accepted for commercial service in 150 & 450 MHz bands.

Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. Great for making club announcements! only \$100.

REP-200C Economy Repeater. Real-voice ID, no dtmf or autopatch. Kit only \$795, w&t \$1195.

REP-200N Repeater. Without controller so you can use your own. Kit only \$695, w&t \$995.

You'll KICK Yourself If You Build a Repeater

Without Checking Out Our Catalog First!

Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, p's, and receivers, we offer the following controllers.



COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer. only \$49/kit, \$79 w/t.

CWID. Traditional diode matrix ID'er. kit only \$59.

CWID-2. Eprom-controlled ID'er. only \$54/kit, \$79 w/t.

DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. \$59/kit, \$99 w/t.

COR-4. Complete COR and CWID all on one board. ID in eeprom. Low power CMOS. only \$99/kit, \$149 w/t.

COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. kit only \$99, w/t only \$149.

COR-5. µP controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. \$379 w/t.

AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. kit \$89.

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. kit \$79.

TD-4. DTMF controller as above except one on-off function and no toll call restrictor. Can also use for selective calling; mute speaker until someone pages you. kit \$49.

WEATHER ALERT RECEIVER

A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts.

Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!

Automatic mode provides storm watch, alerting you by muting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; all 7 channels (162.40 to 162.55).

Buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. Also available factory wired and tested.

- RWX Rcvr kit, PCB only\$79
- RWX Rcvr kit with cabinet, speaker, & AC adapter\$99
- RWX Rcvr wired/tested in cabinet with speaker & adapter\$139

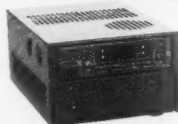
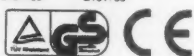


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MODEL SS-10TK



MODEL SS-12IF



MODEL SS-18



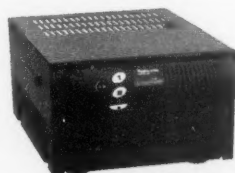
MODEL SS-25M



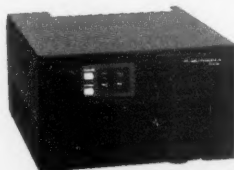
MODEL SRM-30



MODEL SRM-30M-2



MODEL SS-12SM/GTX



MODEL SS-IDEFJ-98

...POWER ON WITH ASTRON

SWITCHING POWER SUPPLIES...

SPECIAL FEATURES:

- HIGH EFFICIENCY SWITCHING TECHNOLOGY SPECIFICALLY FILTERED FOR USE WITH COMMUNICATIONS EQUIPMENT; FOR ALL FREQUENCIES INCLUDING HF
- HEAVY DUTY DESIGN
- LOW PROFILE, LIGHT WEIGHT PACKAGE
- EMI FILTER
- MEETS FCC CLASS B

PROTECTION FEATURES:

- CURRENT LIMITING
- OVERVOLTAGE PROTECTION
- FUSE PROTECTION
- OVER TEMPERATURE SHUTDOWN

SPECIFICATIONS:

INPUT VOLTAGE: 115 VAC 50/60HZ
OR 220 VAC 50/60HZ
SWITCH SELECTABLE
OUTPUT VOLTAGE: 13.8VDC

AVAILABLE WITH THE FOLLOWING APPROVALS: UL, CUL, CE, TUV.

DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1 1/4 x 6 x 9	3.2
SS-12	10	12	1 1/4 x 6 x 9	3.4
SS-18	15	18	1 1/4 x 6 x 9	3.6
SS-25	20	25	2 1/4 x 7 x 9 1/2	4.2
SS-30	25	30	3 1/4 x 7 x 9 1/2	5.0

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2 1/4 x 7 x 9 1/2	4.2
SS-30M*	25	30	3 1/4 x 7 x 9 1/2	5.0

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3 1/2 x 19 x 9 1/2	6.5
SRM-30	25	30	3 1/2 x 19 x 9 1/2	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3 1/2 x 19 x 9 1/2	6.5
SRM-30	25	30	3 1/2 x 19 x 9 1/2	7.0

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25A-2	20	25	3 1/2 x 19 x 9 1/2	10.5
SRM-30A-2	25	30	3 1/2 x 19 x 9 1/2	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3 1/2 x 19 x 9 1/2	10.5
SRM-30M-2	25	30	3 1/2 x 19 x 9 1/2	11.0

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

MFJ 1.8-170 MHz SWR Analyzer™

Reads complex impedance . . . Super easy-to-use

New MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . easy access battery panel . . . smooth reduction drive tuning . . .

The world's most popular SWR analyzer just got incredibly better and gives you more value than ever!

MFJ-259B gives you a complete picture of your antenna's performance. You can read antenna SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance ($R+jX$) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in μH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning, easy access battery panel and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The

NEW



Call your dealer
for your best price! **MFJ-259B \$249⁹⁵**

MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, SWR Analyzer™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

Call or write for Free Manual

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1315, \$14.95. Its rugged all metal cabinet is a compact 4x2x6 1/4 inches.

How good is the MFJ-259B?

MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

MFJ-249B, \$229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, \$129.95. Like MFJ-249B but reads SWR only on meter and has no LCD or frequency counter.

MFJ-219B, \$99.95. UHF SWR

Analyzer™ covers 420-450 MHz. Jack for external frequency counter. 7/16x2 1/2 x2 1/4 inches. Use two 9 volt batteries or 110 VAC with MFJ-1312B, \$12.95. Free "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, \$19.95. Plug a dip meter coupling coil into your MFJ SWR Analyzer™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your SWR Analyzer™.

Genuine MFJ Carrying Case

MFJ-29C, \$24.95. Tote your MFJ-259B anywhere with this genuine MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories.

Made of special foam-filled fabric, the MFJ-29C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ SWR Analyzer™ without taking it out of your case. Look for the MFJ logo for genuine authenticity!

MFJ-99, \$54.85. Accessory Package for MFJ-259B/249B/209. Includes genuine MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1315 110 VAC adapter. Save \$5!

New! Tunable Measurement Filter™
MFJ-731, \$89.95. Exclusive MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8 to 30 MHz in presence of strong RF fields. Has virtually no effect on measurements. Works with all SWR Analyzers.

MFJ No Matter What™ warranty
MFJ will repair or replace (at our option) your MFJ SWR Analyzer™ for one full year.

Free MFJ Catalog

Nearest Dealer . . . 800-647-1800

<http://www.mfjenterprises.com>

• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders from MFJ

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Box 494, Miss. State, MS 39762
(601) 323-5869; 8:4-30 CST, Mon.-Fri.
FAX: (601) 323-6551; Add s/h
Tech Help: (601) 323-0549

Prices and specifications subject to change. (c) 1998 MFJ Enterprises, Inc.

MFJ-224
\$159⁹⁵

MFJ 2 Meter FM Signal Analyzer™

Measure signal strength over 60 dB range, check and set FM deviation, measure antenna gain, beamwidth, front-to-back ratio, sidelobes, beamline loss in dB. Plot field strength patterns, position antennas, measure preamp gain,

detect feedline faults, track down hidden transmitters, tune transmitters and filters. Plug in scope to analyze modulation wave forms, measure audio distortion, noise and instantaneous peak deviation. Covers 143.5 to 148.5 MHz. Headphone jack, battery check function. Uses 9V battery. 4x2 1/4x6 1/4 in.

More hams use MFJ SWR Analyzers™ than any others in the world!

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design73@aol.com

On the cover: Fun in the Sun article begins on page 30. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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NEVER SAY DIE

Wayne Green W2NSD/1



climbing. AT&T has raised their estimate from \$300 million to \$900 million. Sears from \$63 million to \$143 million. And so it goes.

Now, supposing that, like the Samsonite test, these upgraded systems crash! That could bring the bears out of hibernation, not only affecting the stock market, but collapsing the house-of-cards power network. Or do you like the domino simile better?

Hmm, have you played dominos recently? It's a semi-no-brain game with chance as the larger element and thus relaxing. You should be playing games with your kids, you know. When's the last time you played gin with them? Michigan rummy? Or Russian Bank? Or cribbage? Do you get together with friends and play games? Like crazy eights? Liar dice? How about Monopoly? Or, if you really enjoy thinking, how about Boggle? That game was invented by a good New York friend of mine who used to go on sports car rallies with me before I moved to New Hampshire. He stayed there and got killed in a street shooting.

Y2K

One of the callers on the Art Bell show told about what happened after the Northridge earthquake, when the people got worried about food. He said that every store was completely empty within four hours. Y2K may be just a nuisance, but if it does fulfill the predictions of the worrywarts, how well are you and your family set up when it comes to having food to eat?

Another Y2K Tidbit

I see where Microsoft has discovered Y2K bugs in Windows 98 and is making an update on CD available. Macintosh computers, however, are Y2K compliant.

The chief Y2K researcher at Gartner Group, a tech think tank, says that 83% of current off-the-shelf software may have Y2K problems, down from 89% a year ago. Well,

Continued on page 55

Y2K, etc.

The controversy goes on—will it be a nuisance or a catastrophe? Most of the nuisance group seem to have oxen that are being gored by the problem, pushing them to put the best face on the situation. The disaster mongers seem to be those who have done the most research into the problem.

Art Bell W6OBB had me as a guest on his show in February and June (both shows were repeated later on "The Best of Art Bell") and we spent quite a bit of time discussing the situation. Art, who's had some of the leading experts on the situation on his show, is genuinely concerned, not just about what may happen come New Year's morning, but in what the potential for disaster may cause people to do which could create super-catastrophes.

For instance, more and more articles on Y2K recommend that, hey, just to be on the safe side, you'd better have some cash put aside. It wouldn't take much of an extra demand for cash to clean out the whole banking system. They're printing an extra \$50 billion, but that isn't going to go far if the general public gets worried.

Then there's the food supply. If the power goes off, our cities will run out of food in an instant. I remember what happened on my submarine when the word went around that we were short of hot chocolate. Seconds later there was no hot chocolate. It had all gone into a couple of personal lockers. Any public belief that there may be a food problem will empty the stores in hours.

So Art's worried about what impact his discussions with experts on the problem may have. If the word gets around that ATMs may have to be shut down, there could be a rush. If people get concerned about the severe recession Y2K is predicted to trigger, there could be a stock market crash as people get the heck out of the stock market, looking to sell high and re-invest later when the market is in the dumpster.

By the way, the experts are sure enough of their worries that they've left the cities and moved to places like Arizona and New Mexico. Just in case, you know.

The situation has me looking over the suppliers of dome homes and solar power systems.

One thing is for sure, if the power grid does crash and stay down for any length of time, a ham station which can run from solar or wind power is going to be worth its weight in gold. As a result of our talk about Y2K and our further talk about the benefits of amateur radio, I've been getting an influx of 73 subscriptions from people who are anxious to get their tickets. Just in case. Well, if the ARRL directors flatly refuse to spend a dime to promote the hobby and try to turn around the plunging interest in it, I guess I'd better do what I can.

I do like the idea of a small survival community in our north forty, living in dome vacation homes. Just in case. So I'm reading *Roundup*, the journal of the Monolithic Dome Institute (Box 479, Italy TX 76651), and *Home Power*

magazine (Box 520, Ashland OR 97520).

Y2K Testing

Maybe you saw the article in *BusinessWeek* about Y2K, saying it is going to be worse than anyone thought. But they were talking about the economic impact, not the social. Ed Yardini, the Y2K guru, keeps increasing the odds that the Y2K bug will create a world recession next year. He's up to 75% so far.

They cited the case of Samsonite, which spent over \$10 million upgrading their computer system. When the system was done, and had been checked by 20 outside consultants as being all set to go, the president of the company flipped the switch to turn it on and nothing happened. The snafu lost them \$10 million in sales and created enormous bad will with their customers. It froze their deliveries for 20 days, and messed up operations for months afterwards.

The moral is that finding and fixing the date-sensitive bugs in computer systems is only the first step. Then comes testing and fixing the undiscovered bugs, plus fixing the new bugs put into the system. And the cost of all this comes right off the bottom line since it doesn't add anything to sales. And that's going to depress earnings, followed by stock price drops. And, by the time you add this impact to several thousand large companies, you have a recession.

Last year McDonald's estimated their Y2K problem at \$8 million. By December it was up to \$30 million and

World's Smallest TV Transmitters

We call them the "Cubes"... Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies- that's a nickel in the picture! Transmits color & B&W with fantastic quality - almost like a direct wired connection to any TV tuned to cable channel 59. Crystal controlled for no frequency drift with performance that equals law enforcement models that cost hundreds more! Basic 20 mW model transmits up to 300' while the high power 100 mW unit goes up to 1 1/4 mile. Audio units include sound using a sensitive built-in mike that will hear a whisper 15 feet away! Units run on 9 volts and hook-up to most any CCD camera. Any of our cameras have been tested to mate perfectly with our Cubes and work great. Fully assembled - just hook-up power and you're on the air!

- C-2000, Basic Video Transmitter Cube..... \$89.95
- C-3000, Basic Video & Audio Transmitter Cube..... \$149.95
- C-2001, High Power Video Transmitter Cube..... \$179.95
- C-3001, High Power Video & Audio Transmitter Cube..... \$229.95



Super Pro FM Stereo Transmitter

Professional synthesized FM Stereo station in easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set freq with Up/Down buttons, big LED display. Input low pass filter gives great sound (no more squeals or swishing from cheap CD inputs!) Limiters for max 'punch' in audio - without over mod, LED meters to easily set audio levels, built-in mixer with mike, line level inputs. Churches, drive-ins, schools, colleges find the FM-100 the answer to their transmitting needs, you will too. Great features, great price! Kit includes cabinet, whip antenna, 120 VAC supply. We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.

- FM-100, Pro FM Stereo Transmitter Kit..... \$249.95
- FM-100WT, Fully Wired High Power FM-100..... \$399.95



RAMSEY Binocular Special

Wow, did we nab a deal on these first rate binoculars! Absolutely identical to a famous big name brand here in Rochester, NY - but without 'their' name. Well made with fully coated optics, super nice rubber armored housing over hi-alloy aluminum, includes lens cleaner cloth, neck lanyard and carry case. 4 styles: roof prism 10x25 (10 power, 25 mm), 10x25 high performance roof prism ruby coated objective lens model for demanding use in bright sun, 10x25 high-end BAK-4 lens porro prism ruby coat with Tac-Grip housing, and Ultra-View 10x50 porro prism ruby coats. First quality, yet at a close-out price on the exact same units as the 'Trademarked' units - but at half price!



- BNO-M, 8x21 Mini Monocular..... \$14.95
- BNO-1, 10x25 Roof Prism Binoculars..... \$24.95
- BNO-1EX, 10x25 Ruby Coated Porro Prism..... \$29.95
- BNO-2, 10x25 TacGrip Ruby Coat Porro Prism..... \$59.95
- BNO-6, 10x50 Ultra-View Ruby Coat Porro Prism..... \$69.95

CCD Video Cameras

Top quality Japanese Class 'A' CCD array, over 440 line line resolution, not the off-spec arrays that are found on many other cameras. Don't be fooled by the cheap CMOS single chip cameras which have 1/2 the resolution, 1/4 the light sensitivity and draw over twice the current! The black & white models are also super IR (Infrared) sensitive. Add our invisible to the eye, IR-1 illuminator kit to see in the dark! Color camera has Auto gain, white balance, Back Light Compensation and DSP! Available with Wide-angle (80°) or super slim Pin-hole style lens. Run on 9 VDC, standard 1 volt p-p video. Use our transmitters for wireless transmission to TV set, or add our IB-1 Interface board kit for audio sound pick-up and super easy direct wire hook-up to any Video monitor, VCR or TV with A/V input. Fully assembled, with pre-wired connector.

- CCDWA-2, B&W CCD Camera, wide-angle lens..... \$69.95
- CCDPH-2, B&W CCD Camera, slim fit pin-hole lens..... \$69.95
- CCDC-1, Color CCD Camera, wide-angle lens..... \$129.95
- IR-1, IR Illuminator Kit for B&W cameras..... \$24.95
- IB-1, Interface Board Kit..... \$14.95

Top quality Japanese Class 'A' CCD array, over 440 line line resolution, not the off-spec arrays that are found on many other cameras. Don't be fooled by the cheap CMOS single chip cameras which have 1/2 the resolution, 1/4 the light sensitivity and draw over twice the current! The black & white models are also super IR (Infrared) sensitive. Add our invisible to the eye, IR-1 illuminator kit to see in the dark! Color camera has Auto gain, white balance, Back Light Compensation and DSP! Available with Wide-angle (80°) or super slim Pin-hole style lens. Run on 9 VDC, standard 1 volt p-p video. Use our transmitters for wireless transmission to TV set, or add our IB-1 Interface board kit for audio sound pick-up and super easy direct wire hook-up to any Video monitor, VCR or TV with A/V input. Fully assembled, with pre-wired connector.

Mini Radio Receivers

Imagine the fun of tuning into aircraft a hundred miles away, the local police/fire department, ham operators, or how about Radio Moscow or the BBC in London? Now imagine doing this on a little radio you built yourself - in just an evening! These popular little receivers are the nuts for catching all the action on the local ham, aircraft, standard FM broadcast radio, shortwave or WWW National Time Standard radio bands. Pick the receiver of your choice, each easy to build, sensitive receiver has plenty of crystal clear audio to drive any speaker or earphone. Easy one evening assembly, run on 9 volt battery, all have squelch except for short-wave and FM broadcast which has handy SCA output. Add our snazzy matching case and knob set for that smart finished look.



- AR-1, Airband 108-136 MHz Kit..... \$29.95
- HFRC-1, WWW 10 MHz (crystal controlled) Kit..... \$34.95
- FR-1, FM Broadcast Band 88-108 MHz Kit..... \$24.95
- FR-6, 6 Meter FM Ham Band Kit..... \$34.95
- FR-10, 10 Meter FM Ham Band Kit..... \$34.95
- FR-146, 2 Meter FM Ham Band Kit..... \$34.95
- FR-220, 220 MHz FM Ham Band Kit..... \$34.95
- SR-1, Shortwave 4-11 MHz Band Kit..... \$29.95
- Matching Case Set (specify for which kit)..... \$14.95

Tiny FM Transmitters

Gosh, these babies are tiny - that's a quarter in the picture! Choose the unit that's best for you. FM-5 is the smallest tunable FM transmitter in the world, picks up a whisper 10' away and transmits up to 300'. Runs on tiny included watch battery, uses SMT parts. FM-4 is larger, more powerful, runs on 5-12 volts, goes up to a mile. FM4.5 operate in standard FM band 88-108 MHz. FM-6 is crystal controlled in 2 meter ham band, 146.535 MHz, easily picked up on scanner or 2 meter rig, runs on 2 included watch batteries. SMT (surface mount) includes extra parts in case you sneeze & lose a part!

- FM-4MC, High Power FM Transmitter Kit..... \$17.95
- FM-5, World's Smallest FM Transmitter Kit..... \$19.95
- FM-6, Crystal Controlled 2M FM Transmitter Kit..... \$39.95
- FM-6, Fully Wired & Tested 2M FM Transmitter..... \$69.95



FM Stereo Radio Transmitters

No drift, microprocessor synthesized! Excellent audio quality, connect to CD player, tape deck or mike mixer and you're on-the-air. Strappable for high or low power! Runs on 12 VDC or 120 VAC. Kit includes case, whip antenna, 120 VAC power adapter - easy one evening assembly.

- FM-25, Synthesized FM Stereo Transmitter Kit..... \$129.95



Lower cost alternative to our high performance transmitters. Great value, tunable over FM band, plenty of power and manual goes into great detail about antennas, range and FCC rules. Handy kit for sending music thru house and yard, ideal for school projects too - you'll be amazed at the exceptional audio quality! Runs on 9V battery or power from 5 to 15 VDC. Add our matching case and whip antenna set for a nice 'pro' look.

- FM-10A, Tunable FM Stereo Transmitter Kit..... \$34.95
- CFM, Matching Case and Antenna Set..... \$14.95
- FMAC, 12 Volt DC Wall Plug Adapter..... \$9.95

RF Power Booster

Add muscle to your signal, boost power up to 1 watt over a frequency of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM transmitters, providing radio service through an entire town. Runs on 12 VDC. For a neat finished look, add the nice matching case set.

- LPA-1, Power Booster Amplifier Kit..... \$39.95
- CLPA, Matching Case Set for LPA-1 Kit..... \$14.95
- LPA-1WT, Fully Wired LPA-1 with Case..... \$99.95



FM Station Broadcast Antenna

For maximum performance, a good antenna is needed. Properly tuned and matched antenna is fully PVC enclosed for weather protection and rugged use. Vertical or horizontal mounting, 'F' style connector, 5' long.

- TM-100, Tru-Match FM Station Antenna Kit..... \$39.95



AM Radio Transmitter

Operates in standard AM broadcast band, set to clear channel in your area. AM-25 'pro' version is synthesized for stable, no-drift frequency and is settable for high power output where regulations allow, typical range of 1-2 miles. Entry-level AM-1 has tunable transmit oscillator, runs FCC maximum 100 mW power, expected range 1/4 mile. Both accept line-level inputs from tape decks, CD players or mike mixers, run on 12 volts DC. Pro AM-25 includes AC power adapter, matching case and bottom loaded wire antenna. Entry-level AM-1 has an available matching case and knob set for a finished, professional look. High level modulation for low distortion.

- AM-25, Professional AM Transmitter Kit..... \$129.95
- AM-1, Entry level AM Radio Transmitter Kit..... \$29.95
- CAM, Matching Case for AM-1..... \$14.95



World's Smallest FM Radios

Everyone who sees one of these babies says they just gotta have one! Super cute tiny FM radios have automatic scan/search tuning, comfortable ear bud earphones and we even include the battery. The pager style unit looks like a shrunken pager and even has an LCD clock built-in. You will be amazed at the crystal clear amazing sound! That's a quarter in the picture for size comparison - pretty tiny, huh?



- MFMT-1, World's Smallest FM Radio..... \$11.95
- PFMR-1, Pager Style LCD Clock & FM Radio..... \$12.95

Speech Descrambler

Decode all that gibberish! This is the popular descrambler / scrambler that you've read about in all the Scanner and Electronic magazines. Speech inversion technology is used, which is compatible with most cordless phones and many police department systems, hook it up to your scanner speaker terminals and you're in business. Easily configured for any use: mike, line level and speaker output/inputs are provided. Also communicate in total privacy over telephone or radio, full duplex operation - scramble and unscramble at the same time. Easy to build, all complex circuitry contained in new custom ASIC chip for clear, clean audio. Runs on 9 to 15VDC. Our matching case set adds a professional look to your kit.



- SS-70A, Speech Descrambler/Scrambler Kit..... \$39.95
- CSS, Custom Matching Case and Knob Set..... \$14.95
- SS-70AWT, Fully Wired SS-70A with Case..... \$79.95
- AC12-5, 12 Volt DC Wall Plug Adapter..... \$9.95

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FCC on Y2K

The FCC recently released the Y2K Communications Sector Report. The report is an assessment of Broadcast Television and Radio, and says the public should continue to have access to critical news, emergency information, and entertainment services on January 1, 2000.

The report goes on to say that individual Y2K-related disruptions should be isolated. That Y2K problems are not likely to cripple cable system operations and it appears the vast majority of the nation's cable subscribers will continue to receive cable television service on January 1, 2000.

Y2K problems are unlikely to affect satellites now in orbit. But the report does indicate that isolated high frequency channel outages and some other limited problems may be encountered.

Copies of the report can be obtained on the FCC's Web site [www.fcc.gov]. The FCC's Year 2000 Task Force can be found at [www.fcc.gov/year2000].

Thanks to the FCC, via *Newsline*, Bill Pasternak WA6ITF, editor.

How They Hunt Elephants

Mathematicians hunt elephants in Africa by throwing out everything that is not an elephant, and keeping whatever is left.

Experienced mathematicians attempt to prove the existence of at least one unique elephant, before proceeding per above, as a subordinate exercise.

Professors of mathematics prove the existence of at least one unique elephant, then leave the detection and capture of an elephant as an exercise for the student.

Computer scientists hunt elephants by exercising the following algorithm:

1. Go to Cape Town, South Africa.
2. Work northward in an orderly manner, traversing the continent alternately east and west in a "raster-scan pattern."
3. During each traverse: (a) Catch each animal seen. (b) Compare each to a known elephant. (c) Stop when you detect a match.

Experienced computer programmers modify the algorithm, to ensure that the procedure will terminate, by first placing a known elephant in Ceuta.

Assembly language programmers prefer to execute the algorithm on their hands and knees.

Engineers hunt elephants by catching gray animals at random, and stopping only if one of them weighs within five percent of a previously observed elephant.

Economists don't hunt elephants. They insist

that if elephants were paid enough, they would hunt themselves.

Statisticians hunt the first animal they see N times, and call it an elephant.

Consultants don't hunt elephants or anything else. But you can hire a consultant by the hour to advise you on how to hunt elephants.

Operations research consultants say they could correlate hat size and bullet color to elephant-hunting efficiency, if only someone would first identify the elephants.

Quality assurance inspectors ignore the elephants and look for mistakes hunters make packing their jeeps.

Politicians never hunt elephants themselves, but they will share the elephants you catch with the people who voted for them.

Lawyers don't hunt elephants either. Instead, they follow the herds and argue about who owns the droppings.

Software lawyers claim their clients own an entire herd, based on the look and feel of the droppings.

Vice presidents of engineering, research, and development try to hunt elephants, but their staffs have been set up to prevent success. When a vice president decides to hunt elephants, the staff finds ways to ensure that all possible elephants are "prehunted" before the vice president sees them. If the vice president chances upon a non-prehunted elephant, the staff (1) compliments the vice president's keen eyesight, and (2) enlarges itself to prevent any recurrence.

Senior managers set forth elephant-hunting policies based on the assumption that elephants are just field mice with deeper voices.

Salespeople don't hunt elephants. They sell elephants they haven't caught, for delivery two days before the season opens.

Software salespeople ship the first thing they catch and write up an invoice for an elephant.

Hardware salespeople catch rabbits, paint them gray, and sell them as "desktop elephants."

This piece, whose author is unknown, was submitted by Joel K9TBD, to the Delaware-Lehigh ARC "W3OK Corral"—Clarence Snyder W3PYF, editor. It appeared in the April 1996 issue, according to the November 1996 issue of the ARNS Bulletin.

Good Morning, Kosovo!

The war against Yugoslav strongman Slobodan Milosovic was waged in the air and also on the airwaves. As bombs and cruise missiles tore apart the Serbian infrastructure, NATO began a campaign of direct broadcasting to the Serbs.

Q-News' Graham Kemp VK4BB explained: *The United States sent two aircraft—transmitting*

radio and television messages over normal broadcast frequencies—to the area of the Serbian crisis. According to Glenn Hauser's Short Wave DX report, two "Commando Solo" aircraft of the 193rd Special Operations Wing left the USA for the Balkans at the end of March.

The RSGB news service reported that the two planes flew at around 20,000 feet and broadcast on 1003 kHz medium wave, and 87.9 MHz VHF, around the clock, to Serbia and Kosovo. The significance of these two frequencies was that 1003 kHz lay between the regular channels of 999 kHz and 1008 kHz, which both carry Serbian programs from Belgrade. The 87.9 MHz frequency was within 200 kHz of local broadcasts in Novi Sad.

Adapted from *Newsline*, Bill Pasternak WA6ITF, editor, with thanks to Q-News.

An Internal Government Memo on Y2K

Dear (Name):

Our staff has completed the 18 months of work on time and on budget. We have gone through every line of code in every program in every system.

We have analyzed all databases, all data files, including backups and historic archives, and modified all data to reflect the change. We are proud to report that we have completed the "Y-to-K" date change mission, and have now implemented all changes to all programs and all data to reflect your new standards: Januark, Februark, March, April, Mak, June, Julk, August, September, October, November, December. As well as: Sundak, Mondak, Tuesdak, Wednesdak, Thursdak, Fridak, Saturdak.

I trust that this is satisfactory, because to be honest, none of this "Y-to-K" problem has made any sense to me. But I understand it is a global problem, and our team is glad to help in any way possible. And what does the year 2000 have to do with it? Speaking of which, what do you think we ought to do next year when the two-digit year rolls over from 99 to 00? We'll await your direction.

Seen in the March 1999 B.A.R.C.'s Bark (from an unknown source via the Internet).

Three Types of Hams?

I have come to the conclusion that there are three different types of hams.

1. The "disgruntled" ham.

This type of ham is easy to find. He is bitter, for some unknown reason, and does nothing to help out the amateur community. What he does is complain a lot, get angry, yell and/or cuss, and in general be a pain in the behind. He does not care about amateur radio—just himself. Kind of depressing when you think about it.

2. The ham who wants help and/or is "new" to amateur radio. Now, this ham could end up like

Continued on page 54

MFJ TUNERS

MFJ-989C Legal Limit Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's AirCore™ roller inductor, new gear-driven turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips,

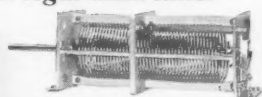


MFJ-989C
\$359⁹⁵

shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-

Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, TrueCurrent™ Balun, scratch-proof Lexan front panel -- all in a sleek compact cabinet (10 1/2" W x 4 1/2" H x 15 D in).



MFJ AirCore™ Roller Inductor gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive Self-Resonance Killer™ keeps damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

MFJ No Matter What™ Warranty

MFJ will repair or replace your MFJ-989C (at our option) no matter what for one year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob Differential-T™



Two knob tuning (differential capacitor and AirCore™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10 1/2" W x 4 1/2" H x 15 in.

MFJ-986 \$329⁹⁵



A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-81H! AirCore™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10 1/2" x 4 1/2" x 10 1/2" in.

MFJ-962D \$269⁹⁵



Superb AirCore™ Roller Inductor tuning. Covers 6 Meters thru 160 Meters! 300 Watts PEP SSB. Active true peak reading lighted Cross-Needle SWR Wattmeter, QRM-Free PreTune™, antenna switch, dummy load, 4:1 balun, Lexan front panel. 3 1/2" H x 10 1/2" W x 9 1/2" D inches.

MFJ-969
\$189⁹⁵

MFJ-949E deluxe 300 Watt Tuner

More hams use MFJ-949s than any other antenna tuner in the world! Handles 300 Watts. Full 1.8 to 30 MHz coverage, 48 position Precision48™ inductor, 1000 Volt tuning capacitors, full size peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, QRM-Free PreTune™, scratch proof Lexan front panel. 3 1/2" H x 10 1/2" W x 7 D inches.

MFJ-948, \$129.95. Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-949E \$149⁹⁵

MFJ-941E super value Tuner
The most for your money! Handles 300 Watts PEP, covers 1.8-30 MHz, lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek 10 1/2" W x 2 1/2" H x 7 D in.

MFJ-945E HF+6 Meter mobile Tuner
Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. Lighted Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz and 6 Meters. 300 Watts PEP. MFJ-20, \$4.95, mobile mount.

MFJ-971 portable/QRP Tuner
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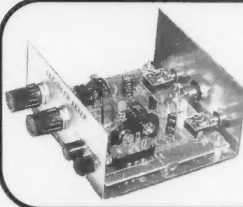
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Specifications		AV-620	AV-640
Bands covered (meters)		6, 10, 12, 15, 17, 20	6, 10, 12, 15, 17, 20, 30, 40
2:1 VSWR Bandwidth (KHz)			
40M	N/A	150	
30M	N/A	175	
20M	500	500	
17M	500	500	
15M	500	500	
12M	500	500	
10M	1500	1500	
6M	2000	1500	
VSWR at resonance (typical)		1.5:1	1.5:1
Power handling (watts output)			
key down 2 minutes	1500	1500	
Vertical radiation angle (degrees)	17	17	
Horizontal radiation angle (degrees)	360	360	
Height (feet)	22.5	25.5	
Weight (pounds)	10.5	17.5	
Wind surface area (square feet)	2.4	2.5	
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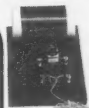
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PIC-based DTMF Project

Build this decoder and learn.

Joseph Consugar KC3XM
1601 Woodtree Court W
Annapolis MD 21401

Recently I was looking through some back issues of some electronics magazines I have and ran across a design for a DTMF tone decoder. It was a good design for its time, but while reading the article, I couldn't help thinking that using today's technology, the circuit could be greatly simplified. It wasn't long before I had the engineering notebook out and was working on an improved design. The result is presented here.

Circuit description

A block diagram of the original circuit is shown in **Fig. 1**. The blocks correspond to the DTMF receiver, decoding circuitry, and 8-digit display of the original circuit.

The decoding circuitry was by far the most complicated portion of the original circuit. It was required to sense when a valid tone was received, decode it, and shift the corresponding digit into the display. To do this, the original circuit

used fourteen TTL chips, eight of which were used to simply hold the decoded digits for display.

Fig. 2 shows the schematic for the updated circuit. Like the original, an integrated DTMF receiver is used, but the fourteen chips used to decode and display the received tones have been replaced by a single PIC microcontroller. In addition, the display, which previously used 7-segment LEDs, has been replaced with a 16x1 LCD display. The resulting circuit is simpler and displays sixteen digits instead of the original eight.

Circuit operation is quite simple. Audio containing the DTMF tones is fed to pin 7 of U2, a Motorola 145436 DTMF receiver. When a valid pair of tones is detected, pin 12 of U2 goes high. This is detected by U1, a PIC 16C84, which reads the code corresponding to the detected tones from U2, converts it to an ASCII character, and shows it on the LCD display. The display shows the last sixteen received codes. Once the display is full, reception of another tone pair causes the displayed codes to be shifted to the left and the new code is displayed on the far right. Pressing switch S1 clears the display, preparing it to receive a new set of tones.

You may notice that U2 and the LCD display are both controlled by the same 8-bit port. This is possible since the outputs of both the LCD display and the DTMF receiver are in a high impedance state until they are addressed. By enabling the LCD or DTMF receiver only when they are being read or written to, the two are able to share a single 8-bit port.

Circuit construction and testing

Before building the decoder, you will have to program a 16C84 with the decoder software. Blank 16C84s are



Fig. 1. DTMF decoder block diagram.

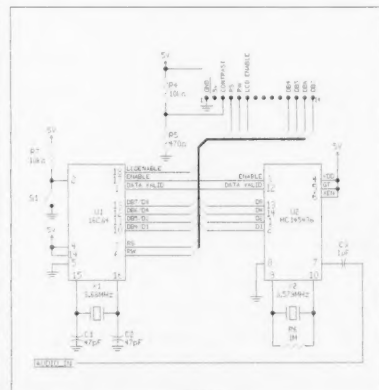


Fig. 2. DTMF decoder schematic.

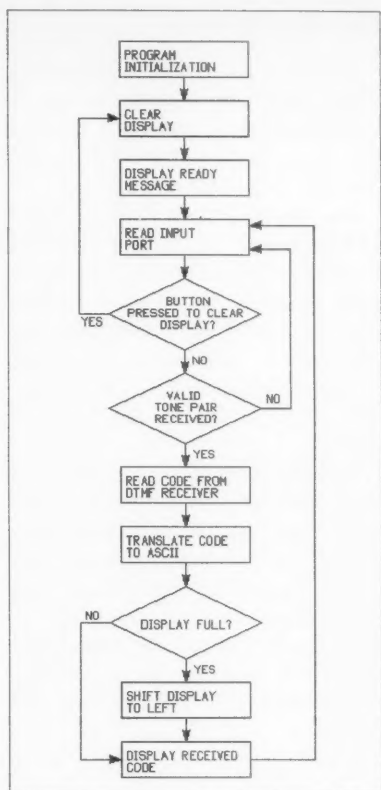


Fig. 3. Software flow diagram.

available from a number of distributors. The decoder software can be downloaded from my Web site at [http://homepages.go.com/~joseph264].

Because of the low frequencies and the small number of chips involved, you shouldn't have any trouble putting the circuit together. The original was built using wire-wrap on a Radio Shack protoboard. Point-to-point wiring should work just as well. Just follow the schematic and remember the normal precautions about keeping lead lengths as short as possible.

One thing needs to be mentioned about the LCD display. The display I used had a physical configuration of one row with 16 columns, but was configured internally as two rows of eight columns. Therefore, the software was written to expect this display configuration. If your display is configured differently, you will have to either try a different display or modify the software to display the decoded digits on a single row. Also, the display connector shown on the schematic consists of a

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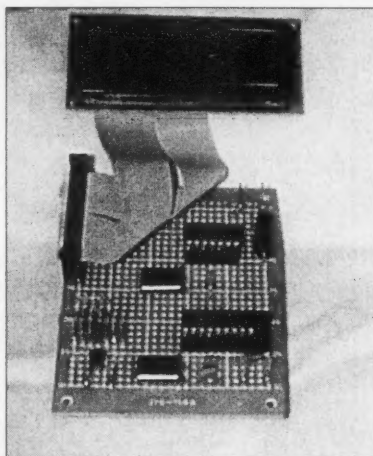


Photo A. DTMF decoder circuit.

single line of 14 pins. You may have to use a different connector depending upon the type of display you use.

To test the decoder you will need a source of DTMF tones. For my own testing, I used a cordless telephone and a scanner. This works because a cordless phone will put out a signal when you press the talk button even if it is not connected to a phone jack.

To use this technique, disconnect the phone from the wall jack and press the talk button. Put the scanner in search mode and locate the frequency being used by the phone's base unit. To confirm you have the correct frequency, press a couple of keys on the hand-held unit. You should hear the tones coming from the scanner's speaker.

Connect the audio output of the scanner to the input of the decoder. Attach a source of 5 volts to the decoder and turn it on. As you press the keys on the phone's hand-held unit, you should see the corresponding digits on the decoder's display. If you don't see anything, try turning up the volume on the scanner. If you still don't see anything, go back and check the decoder's wiring. One good way to do this is to get a copy of the schematic and use a highlighter to mark off all the connections as you check them. It may sound tedious, but I spent quite a bit of time tracking down a problem with one of my original circuits that turned out to be the crystal not being connected correctly. If I had made the effort to use this technique, it would have saved me a lot of time.

Circuit modifications

As shown, the decoder is intended to connect to a radio's headphone jack. If you wish to use it with a low level audio source (e.g., a microphone), you may have to provide an amplifier.

This circuit and its software could also be used as the basis of a DTMF remote control circuit. This would require replacing the software routines used to control the display with one that writes the appropriate control words to the 16C84's port. This is, as they say, left as an exercise for the interested reader.

Should you decide to build this circuit, I hope you find it as interesting as I did. I still find it amazing how much a single 16C84 can do, especially with a little judicious programming. And the best part is, if you don't like the way the circuit works, you can always change the software. Beats rewiring and swapping TTL chips any day. **73**

Parts List

Designation	Part
C1, C2	47 pF NPO disc capacitor
C3	1 µF nonpolarized electrolytic capacitor
R4, R7	10 k 1/4 W resistor
R5	470 ohm 1/4 W resistor
R6	1 meg 1/4 W resistor
X1	3.68 MHz xtal
X2	3.579 MHz xtal
U1	PIC 16C84 microcontroller (18-pin DIP package). If you are unable to locate a PIC 16C84, a PIC 16F84 can be used instead.
U2	MC145436 DTMF receiver (14-pin package). Available from JDR Microdevices [http://www.jdr.com].
S1	Normally open, momentarily closed switch
LCD	16x1 LCD display. Available from Marlin P. Jones and Associates [http://www.mppa.com].

Table 1. DTMF receiver parts list.

How to Turn a Deaf Ear

... with your antenna.

Keith Woodward VK2AT
19 Dolphin Ave.
Taree NSW 2430
Australia

A short while ago, I was approached by a friend with a problem. It appears that he was suffering from an interfering signal, on one frequency, from a specific direction. "Could I," he asked, "suggest an antenna with good rejection in one direction but a broad polar response otherwise?"

Dropping this in my lap, he sauntered away with a smile—or was it a smirk?—on his face.

Before going into detail of what finally emerged, let me stir your memory regarding transmission lines. One useful feature of a quarter-wavelength transmission line, or odd multiples thereof, is its ability to transform impedance. Thus a low impedance at one end of a quarter-wavelength becomes a high impedance at the other end, the transformation ratio depending on the impedance of the line.

The following equation allows the calculation of the resulting impedance when the initial impedance and the line impedance are known.

$$Z_r = \frac{Z_l^2}{Z_i}$$

where Z_l = line impedance, Z_i = low impedance at one end of the quarter-

wave line, and Z_r = impedance seen at the other end of the line.

Substituting in the equation above, we see that if the low input impedance is 50 ohms and the line impedance 300 ohms, then an impedance of 1800 ohms will be apparent at the high impedance end of the quarter-wave transmission line. If you don't believe me, get your kid to work this with his calculator.

Well, that's the worst part. Now all we need to do is a simple application of Ohm's Law. Assuming pure resistance, then the equation of $R_t = 1/(1/R_1 + 1/R_2)$ can be applied successfully.

Substituting 50 ohms and the value of 1800 ohms, calculated above, the total resistance would be 48.648 ohms. This is so little different from 50 ohms that it could be neglected when being fed with 50-ohm coaxial cable from a transmitter.

So what?! What has this to do with directional antennas? The answer is, quite a lot when combining driven elements in an antenna!

In referring to my library of antenna publications, I found that it looked like phasing two half-wave antennas to produce a cardioid-like pattern would solve my friend's problem. With a

spacing of one-quarter wavelength and a phasing of 90 degrees (one-quarter wavelength) or 270 degrees (three-quarters wavelength), the desired pattern may be achieved. Assuming a set direction of null, the feedpoint would have to be changed from one half-wave dipole to the other depending on whether the transmission line (phasing line) was one-quarter or three-quarters wavelength.

My wife will tell you that I am a born skeptic, so I chose a boom one wavelength long and centered the two driven elements on the boom. This left three eighths of a wavelength on each end of the boom for experimentation. Also, being naturally lazy, and suffering from arthritis, I then instructed my friend to build the antenna and test it at his location. Using a one-inch boom and three-eighths-of-an-inch tubing, my friend proceeded with his task. The insulators were good-condition TV ones, the securing screws three-sixteenths-inch stainless steel.

When erected on a rotator, the antenna had its pattern measured; it was found to be as theory suggested, but the null was insufficient for his problem signal. The next step was to install a reflector element a fifth of a wave-

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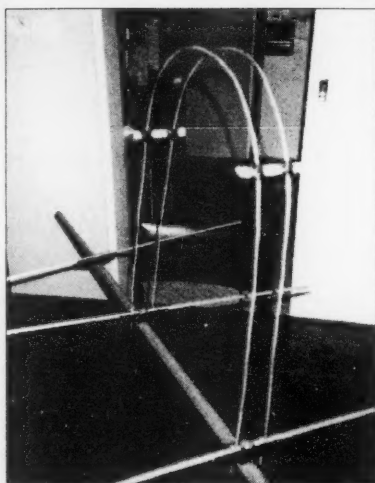


Photo A. The prototype hooped it up pretty well.

length behind one of the driven elements. To maintain symmetry, it was also mounted on a TV insulator, with an aluminum strip joining both halves in the center. On testing the pattern, the rear rejection was greatly improved and sufficient to solve the interference problem. However, the front lobe now exhibited a small dip.

While the antenna was satisfactory in operation as far as my friend was concerned, I stubbornly wanted to add the final touch to the antenna. After considering a parasitic director and a driven element, I chose the latter with the hope that it might give a broader frequency response. This meant that a driven element of the same size was added a quarter of a wavelength in front of the other two.

On test, the side response dropped and the front response increased while exhibiting a deep rejection to the rear. The small lengths of boom material

were trimmed purely for aesthetic reasons. In the original test antenna (Fig. 1), a three-quarter-wavelength line was used between the two original driven elements, with the feedline connected to the dipole farthest from the reflector. The third driven element was connected to the feedpoint with a quarter-wavelength line, thus retaining the feedpoint on the central dipole. The phasing line was 3 mm-diameter solid aluminum spaced approximately 26 mm apart center to center. This was to suit the driven element center spacing of the stainless steel screws.

The three-quarter-wavelength line needs to have the slack of a half-wavelength taken up. In Photo A, you can see that the prototype uses a "hoop" between the driven elements. After the photo was taken, a plastic support was fastened between the boom and the center of the "hoop." The practical side of this arrangement left something to be desired. Another way to achieve 270-degree phasing is to use a quarter wavelength (90 degrees) and cross the feeder (180 degrees). The final antenna used this method (Fig. 2) and proved quite satisfactory in performance. Note that the quarter-wave spacing should be retained, but because of the crossed feed, the harness will be slightly longer than a quarter wavelength.

The SWR was quite low on the antenna. Remember, theoretically the resistive impedance for two elements was 48.65 ohms, suggesting a possible SWR of 1.03:1. Adding the third driven element would lower this to 47.37 and produce an SWR of 1.05:1.

Continued on page 29

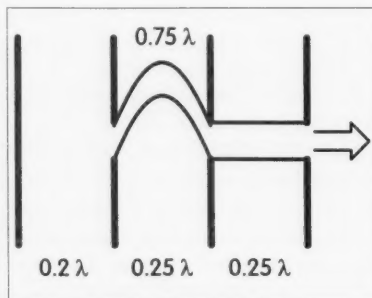


Fig. 1. Original test antenna.

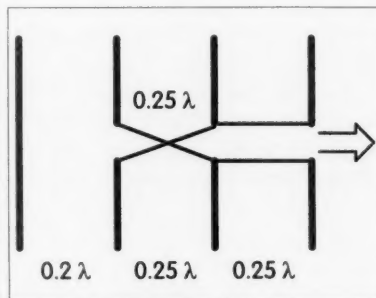


Fig. 2. Final version.

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Secrets of Transmission Lines

Part 1: Intro and dummy load project.

Jack Kuecken KE2QJ
2 Round Trail Drive
Pittsford NY 14534

Considered as a group, radio hams are a fairly inquisitive bunch, interested in a variety of things. There are a large number of subgroups within the fraternity. Some are interested in the competitive aspects and fight for the DXCC awards, and others are avid testers. Some are simply rag-chewers who like to get together with cronies on a net and discuss nearly any topic. Some are tinkers who have to try the newest in slow scan or live TV or whatever. A few are hardware developers who build new and different equipment.

One thing is a bit surprising. Considering the technical nature of the hobby, the percentage of electrical engineers is relatively small. Ham radio attracts people from all walks of life. We all have to pass theory tests to obtain our licenses, but for most this consists of buying a "question and answer" study book aimed at a particular library or pool of questions. It can be argued that this approach does not necessarily impart a fundamental knowledge of the topics.

This series is intended for those who would like to go a little further down the technical road. The object and style of the writing is aimed at imparting a

fundamental understanding of transmission lines, impedance matching, and the Smith chart without necessarily using a lot of high powered mathematics. Each topic will be portrayed with easily repeated physical experiments to be performed with stuff to be found around most ham shacks. In some cases, computer-generated art will be used to illustrate the point. The intent is to promote fundamental understanding rather than mathematical rigor.

Contents of the series

The series will be broken down into the following blocks:

1. Review of DC fundamentals.
2. Review of AC fundamentals.
3. Fundamentals of transmission lines.
4. AC steady state transmission lines.
5. The Smith chart.
6. Impedance matching.

The review of DC and AC fundamentals is included because some grasp of these topics is essential to any understanding of the operation of transmission lines and the subject of impedance matching. Wherever possible, a physically visualizable example, experiment, or illustration is presented.

While we have noted that high-powered math is avoided, some math is necessary, and some knowledge of high-school-level trigonometry and algebra is helpful. Most of the experiments intended to illustrate the point can be performed with readily available hardware items, a multimeter, a two meter handheld transmitter, some junk box parts, and some spare coax cable. A calculator with trigonometric functions is helpful but not mandatory.

Let's see how we can get started on this venture.

DC fundamentals

In this section, we shall consider only continuous direct currents such as one might obtain from a flashlight battery and solid wires and resistors. Turn on and turn off are not considered. As a beginning, and for our purposes here, the most significant part of understanding DC circuits is described by Ohm's law, named after George Simon Ohm. In words, it states that the current flowing in a circuit is proportional to the voltage forcing the current divided by the circuit resistance.

For a physical analogy, consider the illustration in **Fig. 1(a)**. We have a

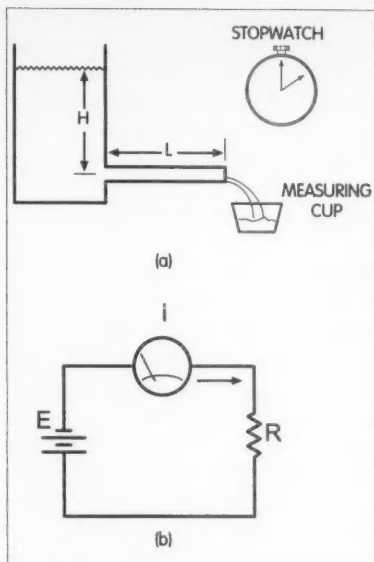


Fig. 1. (a) Ohm's law analogy. (b) Ohm's law in a circuit.

$$(1-1) \frac{E}{R} = i$$

$$(1-2) \frac{\text{volts}}{\text{ohms}} = \text{amperes}$$

container filled with water, a soda straw attached to let the water out, and a container to catch the water. The height of the water above the soda straw (H) is analogous to the battery voltage (E) in Fig. 1(b). The length of the soda straw (L) is analogous to the resistance (R) in the electrical circuit. With the measuring cup and the stopwatch we can measure the time it takes to fill the cup, thus giving us the water

flow in gallons per minute (or cubic centimeters per second), which is more or less analogous to a measurement by the ammeter in the electrical circuit. If we shorten the soda straw to half the original length, the flow will double. Similarly, if we halve the resistance in ohms, the current will double. We don't want to carry this analogy too far, because there are differences between the way water flows through a pipe and electricity flows in a wire, but as far as it goes, the analogy is satisfactory.

Power

To understand the quantity power, we must differentiate it from the physical concept of work. Work is defined mechanically as the product of force and distance. Power is defined as the time rate of doing work. If you lift a 5 pound weight two feet, you have done $5 \times 2 = 10$ foot pounds of work. To calculate power, we must know the time it took to do that work.

When James Watt started selling steam engines to mine owners for pumping water out of mines, he had to come up with some way of describing

the work the machine would do. He found that the Welch ponies walking on a circular track driving the pumping machine could average 550 foot pounds per second, so this value was adopted for the "horsepower." How do we relate this to electrical work?

In Fig. 1, the analogy for the ampere was chosen to represent a flow rate

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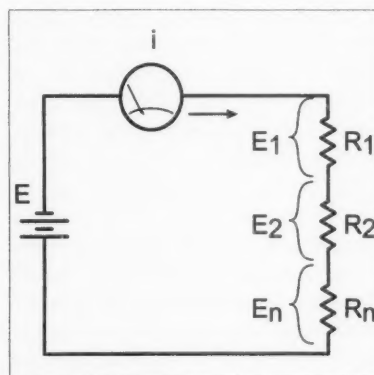


Fig. 2. Series circuits.

$$(1-3) E = E_1 + E_2 + \dots + E_n$$

$$(1-4) E = iR_1 + iR_2 + \dots + iR_n$$

$$(1-5) \frac{E}{R_1 + R_2 + \dots + R_n} = i$$

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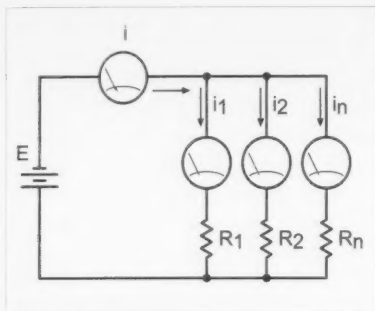


Fig. 3. Parallel or shunt circuits.

$$(1-6) i = i_1 + i_2 + \dots + i_n$$

$$(1-7) i_1 = \frac{E}{R_1} \quad i_2 = \frac{E}{R_2} \quad i_n = \frac{E}{R_n}$$

$$(1-8) \text{ Now let } G_n = \frac{1}{R_n}$$

$$(1-9) \text{ Then, } i = EG_1 + EG_2 + \dots + EG_n$$

$$(1-10) i = E(G_1 + G_2 + \dots + G_n)$$

versus time. The ampere is actually a time rate unit. An ampere is defined as an electric flow rate of one coulomb per second, which corresponds to 6.25×10^{18} electrons per second. A fantastically large number! The product of the force in volts times flow in coulombs per second is power. Thus force in volts times current in amperes is watts. 746 watts equal one horsepower.

Substitution for E or I from Ohm's law also gives useful relationships for power.

$$P(\text{watts}) = E \times i = i^2 \times R = E^2 / R$$

Depending upon the situation, one of these may be more useful than others.

Kirchhoff's law

Kirchhoff's law states that the algebraic sum of the currents at a junction is zero; in other words, the number of

electrons leaving the junction must equal the number entering it.

This is fairly easy to visualize. Suppose that we have the intersection of three streets, each ending at the intersection. If one of the streets is one way inbound and the other two are one way outbound, then the sum of the cars on the two outbound streets must equal the number of cars on the inbound street. If it were less, cars would accumulate at the junction, and if it were more we would have to create new cars at the junction.

Combining loads

When there is more than one resistance in a circuit, the values must be combined in some fashion to solve the circuit. In Fig. 2, we see a series-connected circuit consisting of resistances R1, R2 ... to Rn. In this circuit, the current i passes through all of the resistors. In this case, the sum of the voltage drops across the resistors would equal the battery voltage, and it is possible to simply add up the resistances and divide the battery voltage by the sum.

With the parallel or shunt circuit, we see that the input voltage E is present across all of the resistors and we must add the currents to satisfy Kirchhoff's law (see Eqn 1-6). Now the individual currents are given by the equations in 1-7. If we make the substitution of Eqn 1-8, we can rewrite Eqn 1-6 as Eqn 1-9, and, factoring out the E, we obtain Eqn 1-10.

The substitution of Eqn 1-8 translates from resistance into conductance. The units of G are in conductance given in either mho in older texts or siemens in newer texts. A resistance of 1 ohm is equal to a conductance of one siemens. A resistance of 10 ohms would be equivalent to a conductance of 0.1 siemens. When working with parallel or current combining circuits, it is more convenient to work in conductance.

In terms of conductance in mho:

$$P(\text{watts}) = E^2 \times G = i^2 / G$$

The Wheatstone bridge

The Wheatstone bridge is a very practical circuit that finds use in many places and is particularly helpful in

impedance matching instrumentation. It is shown here mainly because it represents a basic balanced circuit representative of many RF and transmission line measuring systems. It may be seen that if $R_1 = R_2$, point A is at a potential equal to $E/2$. If $R_3 = R_4$, the same is true for point B and no current will flow in the galvanometer (which is simply a very sensitive zero center ammeter). Voltages A and B will also equal the ratio between R1 and R2, which equals the ratio between R3 and R4. In some transmission line instruments $R_1 = R_2 = R_3 = 50$ ohms. In this case, the bridge will null when the transmission line, substituted for R4, is 50 ohms. This gets a tad ahead of the text, but it represents an important case in which the VSWR is 1.0:1.

A practical example

For a practical example, we will look at the design and construction of a dummy load or dummy antenna which we shall use later in the program. This is something you should have around the ham shack anyway. Since the resistors are going to be paralleled, we will work in conductance.

To begin with, we would like to have the unit handle the output of a conventional transceiver. With a nominal 100 watt transceiver, a 50 watt load is usually adequate for most measurements, since the transceiver is usually not capable of long-term key-down output in excess of 50 watts average. We can get a rating like this by paralleling about 25 resistors with 2 watt ratings. Note that an RF dummy load cannot be built using wirewound resistors—even so-called non-inductive ones. Carbon composition or metal film types are suitable to 30 or 50 MHz.

The illustration of Fig. 5 shows the general construction. A "cordwood"-type construction is used. Two pieces of 1/16-inch printed circuit board, preferably the fiberglass type, are cut and drilled with a regular drill plan on 0.5-inch centers. The boards may be stacked, foil side out, and drilled simultaneously. The selected resistors are a little less than 3/16 of an inch in diameter, so there is plenty of air space between them. This is important for cooling.

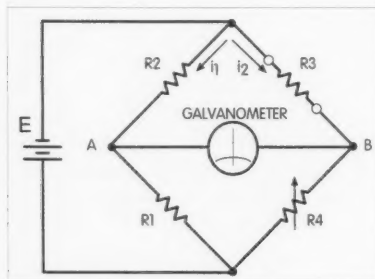


Fig. 4. The Wheatstone bridge. If $R_1 = R_2$ and $R_3 = R_4$, voltage A = B and no current flows in galvanometer. Also true if $R_1/R_2 = R_3/R_4$.

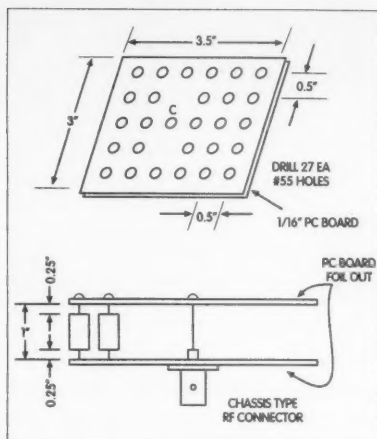


Fig. 5. Dummy load project. Resistors are 2 watt metal oxide 5%, 1200 Ω nominal, Tech America #900-0820.

After the small holes are drilled, enlarge the hole marked C in the drawing on one plate only to accept the chassis-type connector you intend to use. A BNC is shown, but you could just as easily use a UHF or type N. Make sure that a 50 ohm connector is used. Mount the connector and solder a lead in its center conductor about 1.25 inches long. You will note that 27 holes are called for and one is occupied by the center conductor.

The target resistance for the dummy load is 50 ohms or 0.02 mho. With nominal 1200 ohm resistors at 5% tolerance, the actual resistance of any resistor could lie between 1140 ohms and 1260 ohms, or between 8.77^{-4} mho and 7.94^{-4} mho. Dividing 0.02 by these numbers tells us that we need between 22.8 and 25.2 resistors respectively. Unless a check with a good digital ohmmeter shows that they are running consistently low in resistance, I would load 25 resistors into the unit.

Load all of the resistors onto the board with the connector. Hold the board with the connector side down. Next, clip the upper end of each resistor lead about a half inch above the resistor end. Clamp the upper board one inch above the connector carrying board. You may have to make some spacers for this. Next, steer the leads one at a time through the appropriate holes in the upper board. Working from the center out, slide the resistors in one at a time. When they have the

resistor body 1/4 inch below the underside of the top board, solder the lead in place. Clip off the excess lead protruding from the top. Avoid soldering any leads on the bottom board until all resistors are soldered on the top board.

After soldering the last resistor on the top board, turn the assembly over and solder each resistor on the board with the input fitting. Clip the leads after soldering.

You now have a relatively sturdy "cordwood" assembly. Measure the resistance across the input connector. If it is less than 50 ohms, you can correct it by clipping one or more resistors. Suppose that the resistance measures 48 ohms or 0.0208 mho. At 1200 ohms, each resistor represents 8.33^{-4} mho, so clipping out a single resistor should bring the conductance to 0.01967 mho or 50.08 ohms.

On the other hand, if the resistance is too high, say 51 ohms, you can add another resistor in one of the vacant holes.

Actually, the 51 ohms would probably be acceptable. However, let's examine what would be required to correct it.

51 ohms = 0.0196 mho, so 0.004 mho would bring the unit to 0.02 mho. However, let's be careful here. For 50 watts dissipated in 0.02 mho, the voltage is :

$$P = E^2 \times G$$

$$50/0.02 = E^2$$

$$E = 50 \text{ V}$$

and in the 0.004 mho correcting resistor:

$$P = 50 \times 50 \times 0.004 = 10 \text{ watts}$$

For a safe rating, you would like to make up the 0.004 mho with 5 each 2 watt resistors, so each should have a conductance of $0.004/5 = 0.0008$ mho. You would need 5 each 1250 ohm resistors to make up the error.

Conclusion

The next section will deal with alternating current fundamentals, where we will look at some of the differences between AC and DC.

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The picture on my computer screen was slanted, but quite recognizable. "I did not get it at all," said the guy on 14.230 MHz, for whom it was intended. I stuck my oar in, and bragged about my reception. "Send us a picture of your own then," said Keith VK2JY. I did, and that was it. I was on slow-scan television. This is him in **Photo A**, in the picture he sent on that first QSO.

"What is slow-scan television?" neighbors and friends ask me. The

name suggests it — it's about sending and receiving pictures slowly.

Sending non-digitized pictures 60 times a second typically takes 5 megahertz of bandwidth even when cutting corners. That is more than 14 times the width of the 20m ham band. Fast-scan TV, therefore, is found here in New Zealand on the 70cm and 23cm bands.

To exchange pictures on the HF bands, you have to slow down transmission and reception, to make them fit inside a voice channel.

Early SSTV relied on long-persistence cathode ray tubes. The beam on an oscilloscope would wander slowly down the tube face, and you watched the after-glow. To transmit, brightness variation modulated an audio tone. Modulated audio is still the method used now.

After the low-glow came scan converters using digital shift registers. The audio tones were converted to numbers (analog-to-digital conversion), which were scanned into the shift register.



Photo A. VK2JY and XYL.



Photo B. And now a word from Bronc and John ...

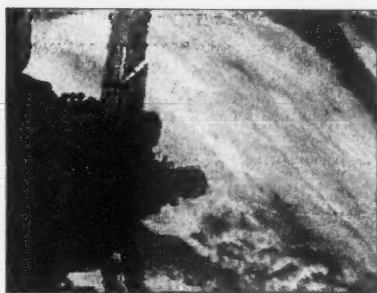


Photo C. A shot from MIR.

The shift registers were then scanned at a rate fast enough for an ordinary TV. Later, separate memory did away with having to tape images just for instant replay.

Commercial scan converters available in the US were the Robot-Research series. Britain had "Wraase-Elektronik" gear. These introduced transmission standards still supported. *The Slow Scan Companion* (1987) by the British Amateur Television Club mentions other makes as well.

Scan converters were also available as kits. Still in use down here is the LM-9000, which was a technical education project by John VK3LM. That is him on the right in Photo B.

Also in the '80s, scan converter emulator programs became available for microcomputers. The Commodore VIC20 and C64 had a receive-only program. I used a Sinclair Spectrum for reception only, though it allowed transmission as well, and it did not need an external interface. These 8-bit machines were limited by lack of memory and slow speed when compared with dedicated scan converters. I could receive in black and white only, and noise

Continued on page 22



Photo D. KF7OH sent this along.

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Photo E. ZLIBKG floated this image.

from the computer and the TV monitor required strong signals on reception.

It was for scan converters that the first transmissions standards were created. Robot-36 uses a black and white image with a color component added, which made it compatible with black and white modes in use at the time. This is the mode used on the *MIR* space station, on 145.985 MHz during weekends.

Photo C was received from *MIR* by ZL3WWW. I have also seen great *MIR* pictures obtained by ZL2CX.

When I used my Sinclair Spectrum, color pictures were also sent as three separations, one after the other — red, green, and blue. They proved incompatible with the SSTV modes that followed, Scottie-1 and Martin-1. These have a resolution of 320 x 256 pixels, and sent red, green, and blue line by line, taking about 2 minutes to transmit. Both modes were supplied in ROMs for scan converters.

A bitter war was fought between their originators over which version proved more immune to interference and changes of propagation. Scottie-1 is favored in the US and down here,

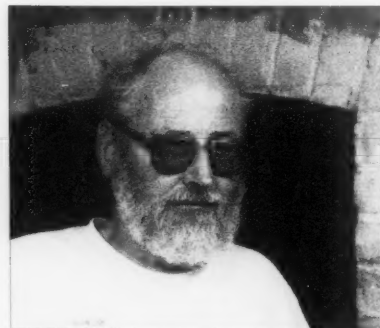


Photo F. The author before ...

and Martin-1 in Europe. The Japanese play it both ways. The main difference seems to be that one scans from left to right, the other from right to left.

320 x 256 pixel resolution is also used at double the speed with Scottie-2 and Martin-2 in good HF conditions. For bad conditions, times are extended with Scottie-DX, SC-180, and WR-180.

On **Photo D**, a picture from Rob KF7OH, the mode WR-180 limited the blurring I usually get from the US. Blurring occurs with multipath reception. I used an editing facility to get rid of the worst noise lines.

There are now resolutions of 640 x 496 available, suitable for VHF and UHF.

Later scan converters were micro-processor-controlled, and allow other modes, if you could get the ROM for them. They work with a camera, and some generate text. **Photo E** is an example sent by Trevor ZLIBKG from his LM-9000 scan converter.

Scan converters required a lot of money, and time, and considerable expertise. With home computers becoming faster, and equipped with video cards and sound cards, the whole job can now be done more easily.

Most programs inevitably are for IBM clones. Some need a simple interface plugged into the serial port, described in the program. The serial port should employ a standard Universal Adapter for Reception and Transmission chip (UART). The serial port is used as an A-D, D-A converter (analog/digital). The interface has an op amp boosting the audio voltage to RS-232 levels for reception, and a low-pass filter for smoothing the audio out of the serial port. Such programs generally work under DOS. EZSSTV is the preferred free program of that type down here, because it supports Robot-36 from *MIR*. Pasokon is the paid-for version, to be preferred if you don't want to be limited to Robot-36, Scottie-1, and Martin-1.

All the Windows programs I have seen and heard of use the sound card for A-D and D-A conversion. They should be Sound Blaster compatible. Laptops may offend on that one. JVComm and ChromaPix I see mentioned most often, but there are lots of others.



Photo G. ... and after retransmission.

A good place to start looking for information and programs is on the Internet, at [<http://www.ultranet.com/~sstv>].

There are small hurdles: Picture reception has to be synchronized with transmission, to get the verticals straight and the colors in the right place. All formats have sync pulses at the beginning of each line. Noise pulses then can cause synchronization to be lost. For that reason, all programs I know of look for an identifier for the mode, then use the computer clock for maintaining picture synchronization. They only look for the first sync pulse when starting picture reception manually.

EZSSTV asks you to receive several pictures so that it can adjust itself to the computer clock, but most programs ask you to adjust manually, by straightening the verticals of a picture received.

Sound card users I have listened to had a problem finding a matching audio level from their transceiver. I use a Yaesu FT-847 and a Kenwood TS-570S into the Hamcomm interface.

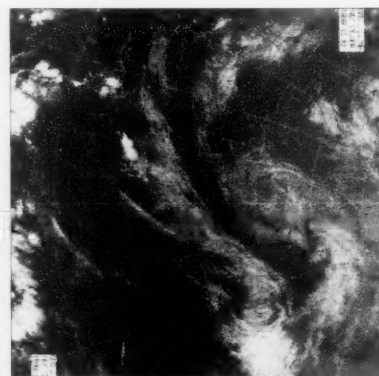


Photo H. And there's always time for WEFAX ...



Photo I. ... and SSTV "art."

Both have sockets at the back providing audio levels suitable for data, which work for SSTV as well. With older equipment you may have to dive into the set to find a suitable level.

But why use SSTV in the first place, when you can stick your pictures as attachments into your E-mail? For me, E-mail cannot match the immediacy of SSTV. Even a noisy reception from *MIR* (because I use an omnidirectional antenna and a hybrid computer, and a program that does not support Robot-36) tells me "This is what *MIR* is seeing now!"

On an off-center-fed dipole for an HF antenna, I still catch European stuff regularly. Mario IØJMH retransmitted one of my pictures (Photo F) from Rome in Italy, and I could still recognize it (Photo G).

If you own a digital camera, then SSTV is a great outlet for your creativity. I have forwarded my photos of a 23cm ATV project, the same day I had taken them, on VHF using SSTV.

My program also supports Weather Fax. This morning, I received from Tokyo this satellite image (Photo H), transmitted on 13.595 MHz. Image broadcasts are at 7.10 and 19.10 UTC.

Some international SSTV frequencies are 14.230, 21.340, and 28.680 MHz. On 20m, the four hours around twilight are most promising in spring and autumn. If you haven't already, you ought to try SSTV — you never know what you might find (Photo I)! 75

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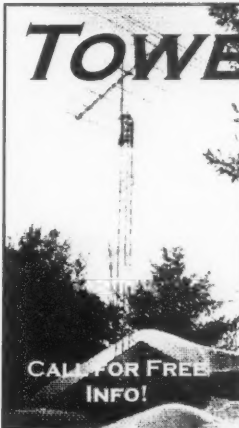
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The Philbrick amplifier was the first commercially available general purpose op amp. It found application in the analog computers of the time and started a revolution. But the days of the analog computer are fading, and the need for the Philbrick amplifier is long gone. In place of the Philbrick are a myriad of monolithic IC op amps in which transistors have taken the place of the

12AX7 dual triode. There are many flavors of op amps, but all have features in common: They are intended to operate with negative feedback. The feedback network determines the operation to be performed.

An operational amplifier, or op amp, gets its name from its ability to perform a mathematical operation. The operation may be as simple as providing gain or as complex as filtering a signal. All of these amazing things derive from the feedback applied around the amp shown in Fig. 1(a).

The negative feedback system shown is composed of an amplifier with gain A whose effective input is the signal summed with a portion $A\beta$ of the output that is fed back. The gain of the amplifier with feedback can be expressed as:

$$A_f = A / (1 - A\beta)$$

where

A_f is the gain with feedback

A is the gain without feedback

β is that portion of the output fed back to the input.

When A is very large and negative, $1/(1 - A\beta) \approx 1/-A\beta$, and $A_f \approx -A/-A\beta \approx$

$1/\beta$. A_f is essentially independent of A . Since β is made up of passive components, A_f is essentially constant.

Obtaining a large gain usually requires several stages of amplification, and applying feedback around a multi-stage amplifier is not a simple process. At some frequency, the gain of any amplifier begins to fall, accompanied by an increase in lagging phase shift.

The phase shift will be -90 degrees at some high frequency for each stage in the amplifier. When the amplifier is made up of more than a single stage, the phase shift will be -180 degrees at some frequency, and the negative feedback changes to positive. Positive feedback leads to the possibility of oscillation.

To avoid positive feedback around a multi-stage amplifier requires control of the phase shift through the amplifier. Lead/lag networks within the amplifier make the phase shift less than 180 degrees at unity gain. The phase shift above unity gain is not important, because a circuit can only oscillate when the gain is greater than one and the phase shift is 180 degrees. Most modern op amps are internally compensated to be stable to unity gain. Uncompensated amplifiers such as the

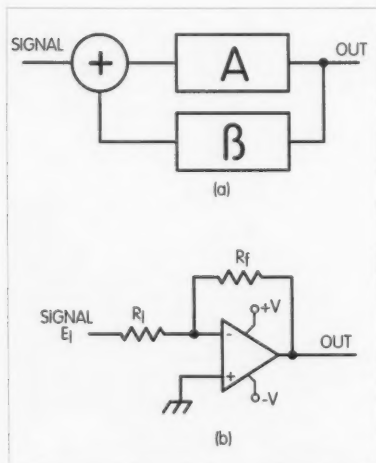


Fig. 1. (a) An amplifier's gain is controlled with feedback. (b) A generic IC op amp is a gain block.

$\mu A709$ list the components that will stabilize the amplifier for a particular gain.

Internally compensated op amps such as the LM741 need no external compensation. A compensated amplifier has a built-in capacitor that causes the response to roll off at 20 dB per decade down to unity gain. The phase shift at unity gain is usually 90 degrees, but may be increased to say 120 degrees at some lower frequency. The op amp is unconditionally stable with any feedback.

Internally, the op-amp IC is a DC-coupled amplifier with differential inputs. The inverting "-" input produces an output that is 180 degrees out of phase with the input, while the non-inverting "+" input produces an output that is in phase with the input. The non-inverting input, sometimes called the reference input, produces an output that is equal to the non-inverting input times the gain of the amplifier.

The design of an operational amplifier gain block can be simplified with a few valid assumptions:

(1) The gain of the op amp is very large, essentially infinite.

(2) The signal input current into the amplifier is zero, the input resistance is infinite.

(3) The phase shift through the amplifier is 180 degrees for the inverting input or 0 degrees for the non-inverting input.

(4) The output resistance is essentially zero. The first assumption ensures that the voltage between the inverting and non-inverting inputs is essentially zero. The second assumption ensures that all of the current in R_i must flow into the resistance R_f .

A simple gain block as shown in Fig. 1(b) results when the signal is applied to R_i and the non-inverting input is at ground. The near infinite gain and negative feedback forces the inverting input to be the same potential as the non-inverting input. That is at "virtual ground." Under these conditions, the input current is E_{in}/R_i and the load on the driving source is R_i . Since the current I_{in} in R_i can only flow in R_f , the voltage across R_f is $I_{in}R_f$ and the output voltage must be $-I_{in}R_f$. The inverting gain is:

$$A_f = E_{out}/E_{in} = I_{in}R_f/I_{in}R_i = R_f/R_i.$$

When R_i is made up of two or more resistors, and with the inverting input of the op amp forced to be virtually zero, none of the current in R_{ia} flows in R_{ib} . The current flowing into R_i is $I_a + I_b$, and the output voltage is $E_o = R_f[E_a/R_{ia} + E_b/R_{ib}]$. When $R_{ia} = R_{ib}$, the output is the sum of the input voltages, and the op amp performs a summing function.

The op amp can also act as a non-inverting amplifier or buffer as shown in Fig. 2. The amplifier has negative feedback provided by R_f and R_i , but the input is applied to the non-inverting input. Again, the near infinite open-loop gain forces the inverting and non-inverting inputs to be virtually equal. Therefore, the voltage across R_i is E_{in} . Since the current in R_i can only come from R_f , the output voltage must be the sum of the voltage across R_i and R_f , or:

$$E_o = E_{in}R_i + E_{in}R_f = E_{in}(R_i + R_f)$$

and the gain A_f is:

$$A_f = E_o/E_{in} = 1 + R_f/R_i.$$

The op amp performs as a buffer when the input is applied to the non-inverting input and the output is connected to the inverting input. With R_f zero, the gain is:

$$A_f = 1 + R_f/R_i = 1 + 0/R_i = 1$$

The output is equal to and in phase with the input. The buffer offers a high input resistance (essentially infinite) and low output resistance (essentially zero).

When the feedback is provided by a frequency sensitive network, the gain

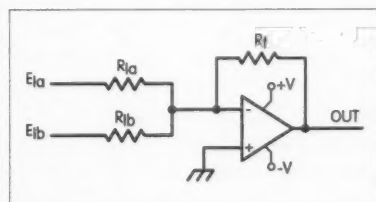


Fig 2. An op amp can produce in-phase gain.

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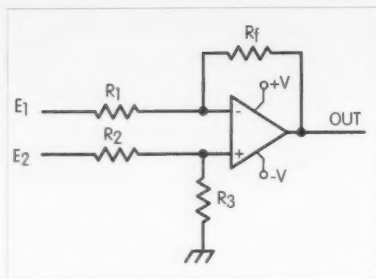


Fig. 3. An op amp can produce the difference of two voltages.

will be frequency sensitive. For example, if the feedback is provided by a capacitor C_f in parallel with R_f , the feedback impedance will be R_f at DC and zero above frequencies where X_c is essentially zero. The low frequency gain will be R_f/R_1 , and will roll off to zero at 6 dB per octave above the corner frequency of $1/2\pi R_f C_f$ hertz, where R_f is in ohms and C is in farads.

Fig. 3 shows a difference amplifier in which the output is $E_o = E_2 - E_1$. The amplifier is basically a combined inverting amplifier and non-inverting amplifier. That part of the output due to the E_1 is $E_1(R_f/R_1)$, while the part due to E_2 is $E_2(1 + R_f/R_1)$. Since the gain afforded E_2 is larger than the gain afforded E_1 , the input from E_2 must be reduced by R_3 and R_1 to equalize the gains. When $R_3/R_2 = R_f/R_1$, the output is:

$$E_o = E_2 [R_f/(R_3 + R_2)] [(1 + R_f/R_1)] - E_1 (R_f/R_1) = (E_2 - E_1) R_f/R_1$$

and when $R_1 = R_3$, and $R_2 = R_3$, the output is $E_o = E_2 - E_1$.

An integrator results when the feedback is provided by a capacitor C_f . When the non-inverting input is at ground, a constant inverting input voltage produces a constant current in R_1 of E_{in}/R_1 . The constant current in R_1 flows into C_f and the output changes at a constant rate of $-E_{in}/R_1 C_f$ volts per second, where R is in ohms and C is in farads.

The maximum rate of change of the output is given as the slew rate. A slew of 0.5 V/ μ sec is typical for garden variety op amps such as the LM741. Slew rate implies a bandwidth limitation.

The bandwidth \times rise time of an amplifier is 0.35. A rise time of 0.5 μ s implies an apparent bandwidth of 700 kHz.

The non-signal characteristics to be considered in designing a particular "operation" are offset current and voltage, and bias currents. These characteristics don't affect the "operation" to be performed, but they do affect the DC output of the amplifier.

The input bias current is the base current in the input transistors and is peculiar to that particular device. The bias current is the average of the two input currents. Bias current flowing in the input resistors generates a voltage at the input of the op amp that is independent of the signal but is just as effective in producing an output voltage. In monolithic op amps, bias currents range from 1 nA to 1 μ A.

Offset current is the difference in input currents. Monolithic op amps have offset currents ranging from 1 nA to several hundred nA. The offset current flowing in the input resistors produces a voltage that may cause either a positive or negative output voltage.

The voltage required across the op-amp inputs to drive the output to zero is called the offset voltage. The voltage ranges from 1 mV to 100 mV for monolithic op amps. Offsets are usually canceled externally; op amps such as the μ A741 have a pair of terminals that can be used to null the offset. A 10 k pot with the arm grounded is connected between the null terminals to adjust the offsets to zero.

The effect of offsets depends on gain. For example, an uncorrected offset of 15 mV would produce an output of 1.5 V when the gain is 100. With AC coupling to small signals, the offset can usually be ignored. But, when the output is large, offset may cause one polarity to limit before the other. In general, it is a good idea to keep the input resistances equal, or unbalanced enough to null the effects of offset.

Operational amplifiers were originally intended for use in analog computers. Now they are used as gain blocks, summing and difference amplifiers, and in active filters that are only remotely seen as analog computer functions. Op amps are such a simple functional block, it's sometimes faster to use an op amp

as a gain block than to design an amplifier stage with discrete components. Op-amp prices are quite moderate, and in terms of circuit board real estate, they are hard to beat.

An op amp is very tolerant of supply voltages, even though the supply voltages determine the limiting output swings that can be achieved. Usually any voltage between ± 5 V and ± 22 V is acceptable. In addition, power supply ripple is not a significant factor. Most op amps reject ripple by 90 dB or so.

The comparator is a close cousin to the op amp, as indicated by their identical circuit symbols. However, the comparator is not intended to operate with negative feedback, and has no control of phase. Also, the output of a comparator is an open collector and requires a resistor from the output to a positive voltage that need not be the same as the IC's power supply. Since the output has no internal pull-up, and there is no phase control, the slew rate can be quite high.

In a comparator, the output switches from the positive rail to within a few tenths of a volt above ground when the input to the inverting input is slightly more positive than the non-inverting reference input. When the inverting input is more negative than the reference voltage, the output is at the positive rail.

Positive feedback is often applied around a comparator to produce hysteresis that removes noise chatter at the threshold of switching. For the values

Continued on page 29

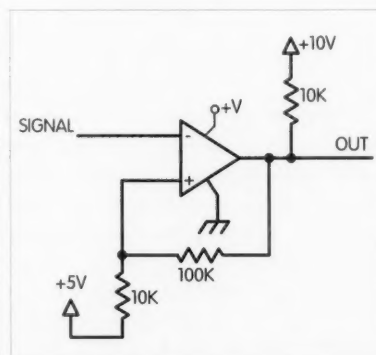


Fig. 4. Hysteresis in a comparator reduces the ambiguity of the threshold.

The Missing Link: A PSK Interface

Stop just reading about it — put this new mode into action!

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A new mode is rapidly gaining popularity on the ham bands. It's called PSK. Those of you who read a lot of technical material already know that stands for Phase Shift Keying, a signaling technique that has actually been around for quite a while on this planet (as well as off, since it's been used in deep space telemetry applications!).

The PSK advantage lies in its bandwidth, which is extremely narrow, allowing you to "slam the door" on accompanying noise to improve overall readability. A rough analogy would be to compare the output of an incandescent light bulb (like SSB or AM) to that of a LASER (PSK!). If your goal is to penetrate long distance with low power, you choose the LASER!

PSK is a digital mode, something like RTTY, in which you type on a keyboard and read on a screen (or the printed paper output of your Model 15!). In the past, it required complex, expensive equipment designed specifically for this application. Today, you may already have two of the three main ingredients in your ham shack: a fairly modern HF SSB transceiver and a PC equipped with a sound card. The third ingredient (and this is the reason for all the excitement on the ham bands) is the innovative software called PSK31, written by Peter Martinez G3PLX. It not only uses the sound card to provide modulation and demodulation, but also provides digital signal processing of the received signal (and other clever features), the means by which advantage is gained in this narrow bandwidth mode (think of it as "software selectivity with intuition"). No need to go buy a super-duper narrow filter for your rig!

But you *will* need an interface to connect your PC to your HF transceiver, because the two are not quite compatible in a number of ways. It is customary in digital modes like this to use low-level receive audio from your

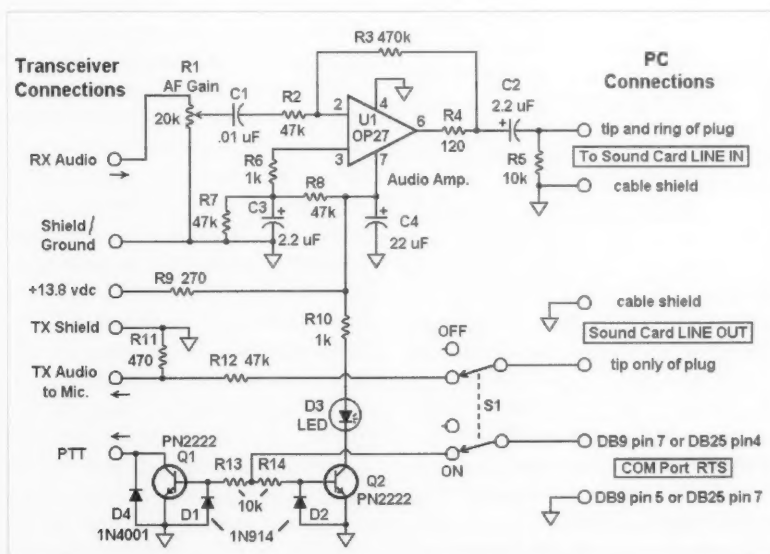


Fig 1. PSK1 schematic diagram.

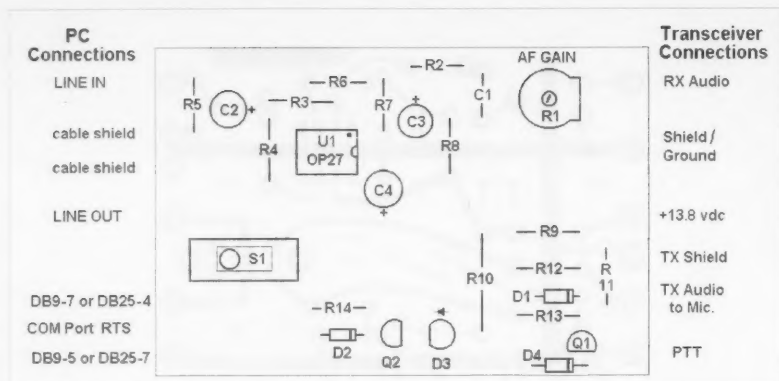


Fig. 2. PSK1 parts overlay.

transceiver (taken from a point between the last detector and volume control). When this is done, you're free to adjust transceiver volume to any comfortable listening level without disturbing the screen display. Fortunately, low-level Rx Audio is available at the rear panel accessory jack of many modern transceivers. This interface (the PSKI) includes an adjustable audio amplifier, U1, to boost it to a level suitable for sound card input.

On transmit, sound card output can easily overdrive the sensitive mike or Tx Audio input of your transceiver. The PSKI includes a 100:1 pad (R12 and R11) to attenuate this level. Transmit-receive switching with PSK31 is

under keyboard/software control, employing the RTS or DTR pin of a user-selected COM port for output. But this control signal is RS-232 level, and must be converted to a "closure to ground" for compatibility with the PTT input of most transceivers. This is taken care of by Q1 and associated components D1 and R13. If your transceiver has a relay coil in its PTT circuit, D4 clips the resulting spike as its magnetic field collapses.

As you can gather, this mode places the transceiver under computer control (they call it "fly by wire" in aviation). And in this case, control is exercised by the RTS (or DTR) pin on the COM port, and the related software. This is no problem when you're running software designed for this application. It works fine. But when you are not running software that "knows" what to do with RTS or DTR, the results may be unpredictable and your transceiver may be inadvertently keyed while, just for example, you're playing Solitaire or off surfing the Net! That's bad. So I've included an LED Transmit Indicator circuit (Q2/D3) to alert you (it should only light up when you initiate Transmit from the keyboard), as well as On-Off switch S1, which should be switched on only when running suitable software for this mode. In other words, switch it on after the software is running, and switch it off before closing it and/or shutting down the PC. This will prevent any computer glitches or software ignorance from keying your transceiver.

A note for real-old-rig users: Q1 can switch PTT circuits up to a few hundred

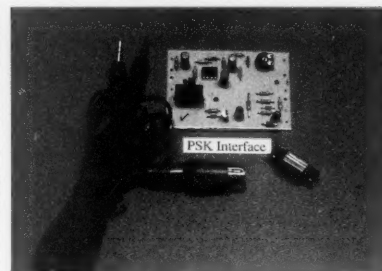


Photo A. The PSKI is quite compact.

milliamps (more than enough for modern transceivers), but if yours requires more than that, or is highly inductive in nature (huge relays!), be prepared to disconnect the PTT line from your transceiver if it stays in Transmit even when the computer indicates Receive and the PSKI LED has extinguished (you've probably blown Q1!).

If you're adept at home-brewing and have a well-stocked junk box, this interface could probably be constructed on perfboard in an evening or two. I enjoy doing PC board layouts, so I've included the artwork designed for my interface along with a parts overlay to show where the parts go. Parts values can be found on the schematic diagram.

Hookup details for the transceiver and PC are provided on the schematic diagram and parts overlay (to the extent that is possible, considering there are so many different transceiver models!). In general, standard shielded stereo cables may be used for the sound card connections. Cut the plug off one end and connect directly to the interface. For Line In on the sound card, use both channels tied together, but for Line Out use just the wire going to the "tip" of the plug on the far end. Connect cable shields to interface ground as indicated. The COM port connection may be made with "twisted pair," "zip cord," or shielded cable if you have significant RF in the shack.

Going from the interface to the transceiver, shielded audio cable is especially important for the Tx Audio-to-Mike connection, even if you are actually going to an accessory jack on the rear panel instead. Shielded cable is probably a good choice for the Rx Audio as well. The PTT and +13.8 VDC connections need not be shielded

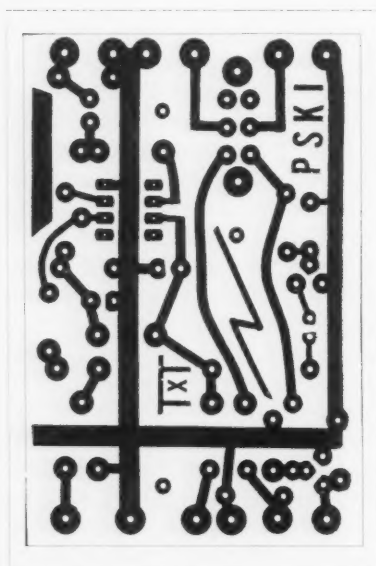


Fig. 3. PSKI board layout.

unless you have lots of RF in the shack. Ground returns for PTT and +13.8 VDC are made via the cable shields of Tx and Rx Audio, so there's no need to run redundant wires. If your transceiver doesn't supply +13.8 VDC at an accessory socket, you'll have to look for a place to "tap in" internally, or use an external supply (which will then require a ground return). A 9 V battery might do the job!

There you have it. The PSKI ties those minor loose ends together and you're up and running. Hope to "see" you soon on PSK!

Notes

1. PSKI kits are available. For details, write Lectrokit, P.O. Box 1856, Sandusky, OH 44871; or visit the Lectrokit Web site at [www.sanduskyohio.com/lectrokit].

2. To read more about PSK31, refer to the May 1999 issue of *QST*, page 41. 73

How to Turn a Deaf Ear

continued from page 14

The reflector element, in practice, added little to the SWR of the antenna. The phasing line used would have a much higher impedance than 300 ohms, lowering the effect of the extra driven elements on the SWR. Note that if you do use 300-ohm line, it must be of the air-spaced variety with dumbbell insulators—otherwise, it would upset the length of the transmission line because of the velocity factor.

The original antenna used three-eighths-inch-diameter elements; this was taken into consideration in calculating element lengths. The lengths and spacing for the antenna with a center frequency of 147 MHz are as follows: reflector, 40.5"; driven elements, 38.7"; spacing between driven elements, 20.1"; spacing between reflector and driven element, 16.1"; quarter-wave-length harness, 20.1"; three-quarter-wavelength harness, 60.3".

Simple scaling should be suitable for any center frequency in the two meter band when using three-eighths-inch-diameter elements. The TV insulators used for the prototype had a spacing of

one inch between the inner ends of the driven elements, the securing screws being one-half inch out from the inner tips of the elements. Remember that the driven element lengths need to be cut in half. The reflector length is the calculated length shown from tip to tip. This length is correct only if insulated from and elevated above the boom. The TV insulators used held the elements approximately one-half inch above the boom.

This antenna was not designed for high forward gain but maximum rear rejection, so do not expect high gains. However, the forward gain is sufficient to be useful.

For those who have not realized it at this stage, I will point out that this antenna is a combination of two cardioid simulation antenna elements and a reflector element. Enjoy building this interesting antenna, which needs no involved matching system (see below). With horizontal polarization, no problems should arise with mounting the antenna. If vertical polarization is what you have in mind, then use a nonmetallic support between the elements. Otherwise, mount the antenna, or a pair of them, offset from the main support pole.

Finally, I suggest that when feeding the antenna you make use of a 1:1 balun or an RF choke. I have found that winding some RG-58CU coaxial cable into a close-wound coil on a length of one-inch plastic conduit is satisfactory. Seven to ten turns is sufficient with mounting close to the feedpoint of the antenna. 73

All About Op Amps

continued from page 26

(100 k and 10 k) shown in **Fig. 4**, the hysteresis is about 0.1 V. The output switches high when the input is below 4.09 V and switches low when the input is greater than 5.05 V.

If switching ambiguities are not a concern, the non-inverting input is just returned to the desired reference voltage, +5 V in the example, and no positive feedback is needed. Without hysteresis, the output switches from

high to low when the input is greater than 5 V, and from low to high when the input is less than 5 V.

The operational amplifier and comparators are great additions to the devices available to the designer/builder. They are easy to use and there are no tricks in their application. The Philbrick amplifier might have been the first op amp, but it certainly wasn't the last. 73

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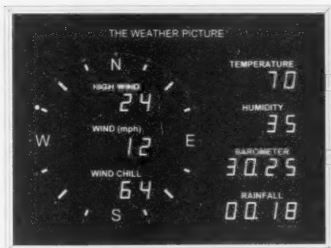
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I've become a full-fledged tree hugger, energy miser, and recycler. I suspect it has something to do with the aging process and my own diminishing physical resources. I feel it happening to me, and see it happening to our little planet.

Now this attitude is spilling over into my amateur radio hobby. I want to be out in the woods, energy independent, and still play with my homebrew stations. In addition, I'm no longer interested in re-inventing the wheel, or plunking down big bucks to buy ready-made radios. So I began pawing through back issues of *73 Amateur Radio Today* to recycle some great ideas and circuits for building myself a portable, self-sufficient QRP

station. And I struck gold: the Ten-Tec QRP transceiver kit was purchased and assembled based upon an excellent review in 73; the Desert Storm solar panel was selected because of a long-running advertisement in 73; the expanded-scale voltmeter was a clever idea published by a fellow ham in 73; and the simple charge controller was borrowed from a previous article of mine, also appearing in 73.

The purpose of this article is not to encourage a cloning, but to share the delight of building a portable, solar-powered QRP station. The emphasis is upon building and incorporating simple amateur radio station accessories, based upon your own ingenuity and resources. The station depicted in the photos reveals that I'm from the school of form follows function. In my own case, since I have very few woodworking and metal forming tools, I used scrap lumber to build the case, a number of small pieces of two-sided PC board for mounting the various accessories, and a lot of screws to hold everything together. As chaotic as the little station appears, it works wonderfully! It is a complete station (including station monitoring equipment),

and when I get the urge to play radio in the woods, everything I need is connected to a couple of carrying handles!

My station was evolutionary in its formation. It began with only the transceiver and a battery fastened to a board with a handle. Then, one after another, came the rest of the bells and whistles. It was a lot of fun! I'd dream up the need for an additional station accessory, build it up on a scrap of PC board, then screw it onto the wooden case. Although this approach may reflect poorly on foresight, in its final form, the accessories are symbiotic—not parasitic.

The following notes and associated drawings describe the subassemblies

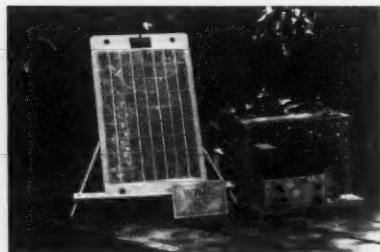


Photo A. W7DE's solar QRP station is handsome as well as functional.

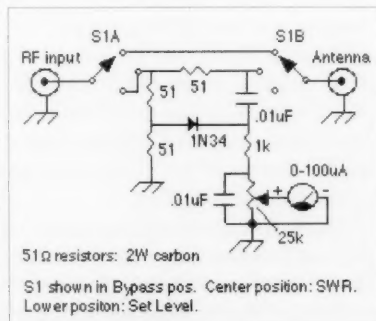


Fig. 1. QRP SWR meter schematic.

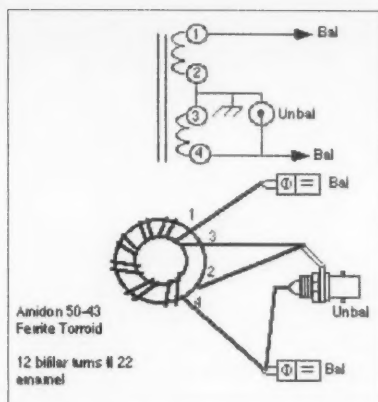


Fig. 2. QRP 4:1 balun schematic and pictorial.

that now cling to the wooden case of my portable QRP station. Some of them are essential, some of them might come in handy, and only one is original—but all of them are useful and fun to build. No detailed physical construction guidance is supplied in this article. It's assumed that doing things your own way is the radio amateur way!

About the transceiver: Although I used the Ten-Tec 1340 QRP kit, there are other terrific kits available (including the bulletproof little NorCal 40A, from Wilderness Radio).

About the battery: Gel-cell batteries are rugged—and they don't leak electrolyte! Don't skimp on the battery by buying a surplus battery—buy a new one. A 4.5 Ah battery will be sufficient for a QRP rig. In the afternoon sun, the solar panel delivers enough power to operate my rig with the key down and still charge the battery. Three hours of nighttime operation will still leave the battery with about 66% of full charge.

About the SWR meter: A sensitive

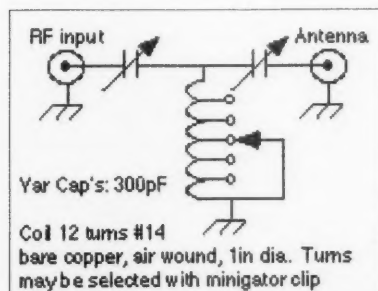


Fig. 3. Antenna tuner schematic.

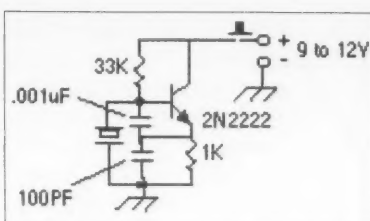


Fig. 4. Signal generator schematic.

SWR meter is an excellent accessory, and it is used together with the antenna tuner. In addition to monitoring the SWR during tuneup, the set level control of the SWR meter can be calibrated to indicate where the sensitivity pot is set for normal RF output from the integrated rig. Therefore, it can double as a relative wattmeter. The schematic appears in Fig. 1.

About the tuner: Camping sites vary dramatically, especially when it comes to finding antenna supports. Therefore, compromises are necessary, and antenna

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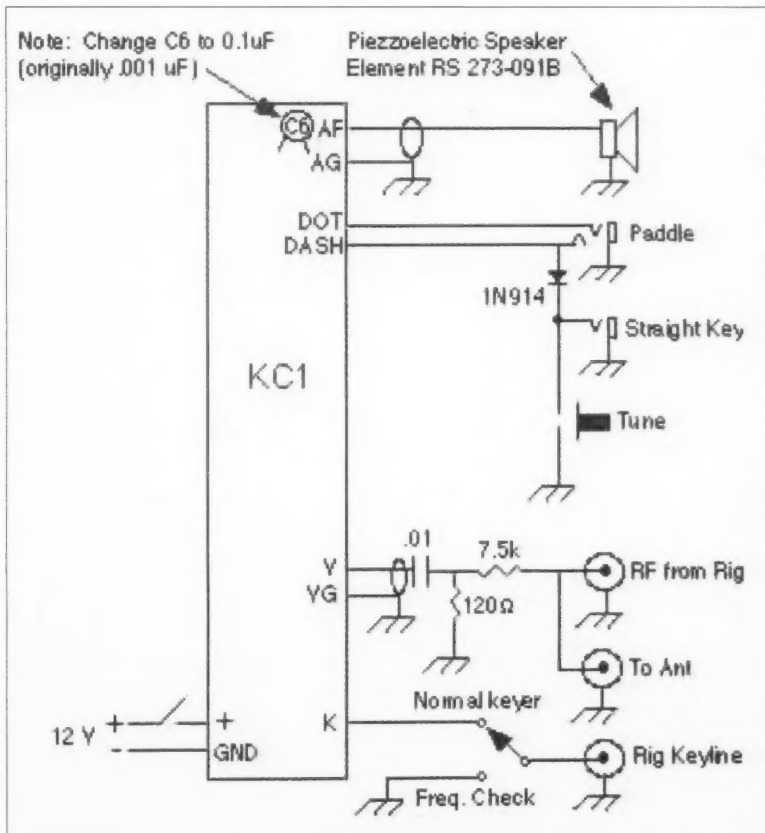


Fig. 5. Interface control panel schematic for Wilderness Radio KC1 keyer and frequency counter.

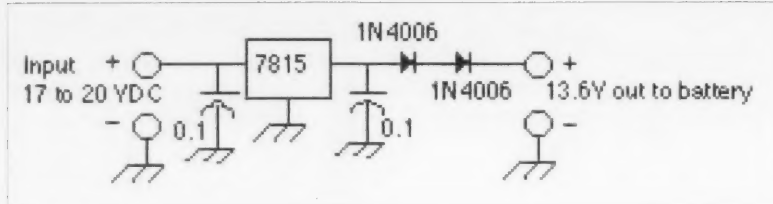


Fig. 6. Charge controller schematic.

tuning is generally required for maximum performance. A capacitor-capacitor tapped inductor tuner works great, and it can be constructed at very low cost.

About the 4:1 balun: The balun does not take up very much space, and it will allow you to use balanced feedlines. You will be able to use folded dipoles and other antennas using balanced lines—then you won't need to worry so much about poor grounding circumstances. Details are shown in Fig. 2.

And if miniature variable capacitors (the type used in transistor pocket radios) are used, the unit can be quite compact. There's nothing particularly critical about a tuner such as this; in fact, the uglier they are, the better they seem to work! Refer to Fig. 3.

About a signal source for checking the receiver section: This is another simple and useful addition. It will allow you to accomplish simple performance tests for sensitivity and frequency calibration. A simple one-transistor circuit is depicted in Fig. 4. No direct connection needs to be made to the transceiver. The little oscillator will put out enough RF to be readily detected. I chose to run the oscillator from a 9 volt battery. The battery will last for years. The crystal specified in the drawing is for 40 meter operation. The oscillator will accept crystals to 20 MHz.

About the keyer: If you're comfortable with a straight key, you simply don't need a keyer. In fact, you don't even need a key! One resourceful ham suggests recycling a computer keyboard switch for forming the dits and dahs. If you decide to use a paddle, there are several excellent amateur keyer kits available. I selected the Wilderness Radio keyer because of its very small size, low battery demands, integrated memory and frequency counter. This unit is designed to be built into the transceiver itself. However, I chose to build it as a stand-alone unit to allow me to substitute other transceivers. The stand-alone modifications to the Wilderness Radio keyer are depicted in Fig. 5.

About the charge controller: If you elect to charge the battery exclusively from the solar panel, you simply do not need the charge controller. In my case, I included the controller for wintertime operation in the Northwest. I use a salvaged 12 volt plug-in wall unit as the charging source. Although the little plug-in wall unit claims to deliver 12 volts at 300 mA, its unloaded terminal voltage is actually 19 volts. It is, of course, simply an unregulated supply, and its internal resistance drops its terminal voltage to approximately 12 volts when supplying 300 mA. This is ideal for use with the simple charge

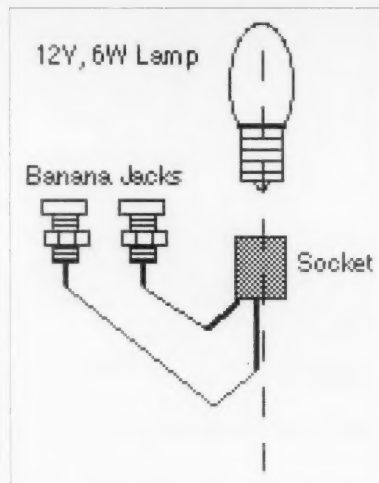


Fig. 8. Solar panel tester.

controller shown in Fig. 6. The charge controller functions by supplying a regulated 13.6 volts (the forward drop of the two diodes reduces the 15 volts from the 7815 to 13.6 volts). The battery charging rate decreases as the battery terminal voltage increases during charging. When the battery terminal voltage (surface charge) equals 13.6 volts, the charging process stops because there is no longer a potential difference between the charging source and the surface charge of the battery. Simple, straightforward, and it works perfectly.

About the dummy load: A simple dummy load fashioned from carbon-clay 2 watt resistors is a very useful addition. Of course, other combinations of resistance values may also be used to achieve 50 Ω and a power dissipation rating of 5 watts or greater. Refer to Fig. 7.

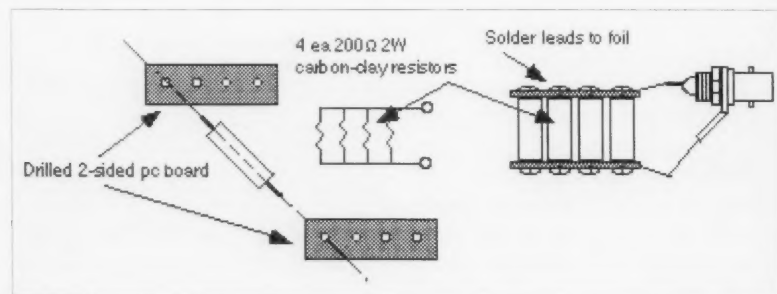


Fig. 7. 50 Ω dummy load.

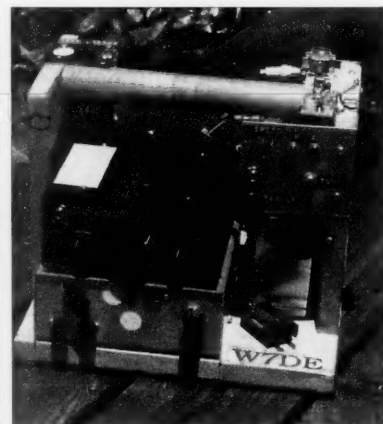


Photo B. Front view of portable QRP station.

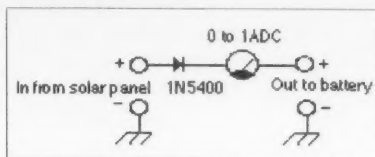


Fig. 9. Solar panel interface schematic.

About the solar panel tester: This is merely a 12 volt, 6 watt incandescent lamp. You simply connect the solar panel to the lamp and adjust the angle and position of the panel for maximum brightness of the lamp. Once this adjustment is made, transfer the solar cell connector to the battery. This is a super-handly accessory—actually a necessity! Refer to Fig. 8.

About the solar panel interface: Well, you have to have someplace to plug the solar panel into, and a place to install the series diode. It is also useful to include an ammeter to monitor the charging current. Using banana jacks and plugs is recommended for connecting the solar panel to the station. Two-circuit, 1/4-inch phone plugs and jacks are not recommended, because the tip electrode of the plug shorts out momentarily while inserting it into the jack. Refer to Fig. 9.

About the solar panel: The Desert Storm solar panels are available from Antennas West. These are very compact and rugged units. They are not cheap, but well worth the money.

There are two very important requirements for using the Desert Storm unit: First, a series diode between the positive lead of the solar panel and the

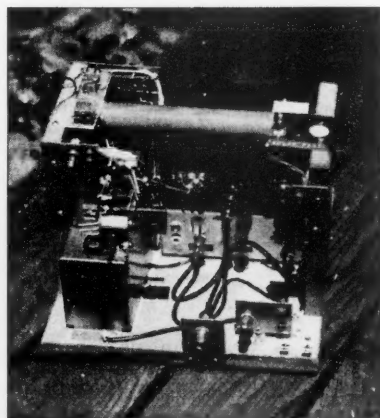


Photo C. Rear view.

battery must be used (a Radio Shack diode, #276-1141, will do the job); and second, the panel must be adjusted periodically to track the Sun and maximize power output. Using the 6 watt incandescent lamp really speeds up the positioning process. Notice the small, collapsible aluminum stand; it allows you to securely position the solar panel. The stand was purchased at an art supply store. The Desert Storm solar panel was my first serious experience using solar energy for amateur radio. It's a very exciting experience to work another amateur station hundreds (and even thousands) of miles away, and know that you're using the ultimate power source—the Sun!

About the paddle: The Paddlette is a terrific little paddle, and I built one into my station. There are several paddle kits on the market, and they look very promising.

About the expanded voltmeter: This excellent item was discussed in the



Photo D. All packed up and ready for a little Radio Fun in the Sun!

"QRP" column by Mike Bryce WB8VGE, on page 70 of the June 1991 issue of 73. The expanded voltmeter will allow you to assess the

Continued on page 38

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I realize this review appears to belong in *Popular Mechanics*—not in an amateur radio magazine. However, the compact shear, brake and roller unit described and evaluated is a wonderful tool for radio amateurs who build their own equipment.

I recently purchased one of the Central Machinery units to support my home-brew addiction, and I've found it superbly useful, especially for working with printed circuit board.

Printed circuit board is one of the most versatile materials available for use in amateur construction. Beyond its customary use for printed circuitry, it can be used for instrument panels, breadboarding, name plates, even complete instrument enclosures. It is easily drilled, tapped, soldered, and polished. And printed circuit board "trimmings"

(left over when manufacturers cut up large sheets) find their way into surplus stores and are sold for a few cents per square inch.

The most difficult fabrication process with PC board is cutting it into geometrically accurate pieces. While small pieces of PC board can be cut with a hacksaw and filed to form acceptable shapes, larger pieces are difficult to form—unless you have a sheet metal shear.

The Central Machinery unit can be used to produce metal chassis boxes, brackets, sheet metal cylinders, cones, etc. While I have yet to master the skills to produce all of these items, I have produced terrific project-specific sheet metal enclosures and brackets, as well as geometrically precise PC board parts. I'm convinced that the extra capability will come in handy in the future (however, I suspect I will require some one-on-one instruction from a sheet metal craftsman). The shear capability alone is worth the price of the tool, and the ability to utilize commercial PC board trimmings for my laboratory projects has already paid for the tool.

The Central Machinery shear is a rugged item and deceptively heavy for its size. The tool's footprint is 14-1/2 inches wide, 11-1/2 inches deep. It is 16 inches high, weighs 125 pounds,

and requires a substantial work stand to support it securely. This is a tool designed for a metalworking shop, where ruggedness and accuracy are the primary criteria, and minor cosmetic details such as dressing rough edges of castings are simply ignored. However, all working surfaces are well machined.

Specifications

Shear specifications: 20 gauge milled steel to the full width of the bed (see comments below).

Wire forming groove sizes:

3/32", 1/8", 5/32", 3/16", 7/32", 1/4"

Die set sizes:

1/4", 3/8", 1/2", 1", (2 ea.) 2", 3", 4"

There were some minor flaws in my shear-brake:

Continued on page 38

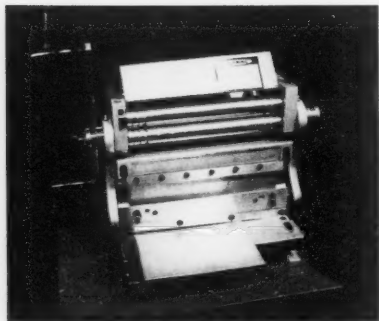


Photo A. The Central Machinery 12-Inch Shear, Press Brake and Slip Roll unit.

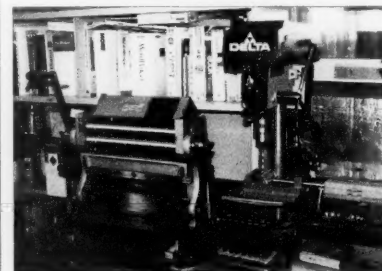


Photo B. Set up and ready to while away a dark winter day in a home-brew wonderland.

Instruction Instructions

Discover hidden savings in the last place you'd ever look—the instruction manual.

by Leon Fletcher N6HYK

Recently I bought an antenna system consisting of the usual four units—tower, antenna, rotor, and rotor control. All the gear is nationally advertised, widely used, and highly regarded by hams throughout the country.

But every unit came with printed instructions that had serious errors, omissions, confusions, even contradictions. Indeed, at least one error was an absolute farce.

How serious is the problem of ham gear supplied with instructions that are inaccurate, inadequate, inferior, incomplete, or just plain bungled? Apparently no one knows. At least a diligent search of ham magazines, handbooks, guides, instructions, and other such publications found no helpful reports, tips, or solutions.

Casual on-the-air comments by hams in Washington, Ohio, Florida, Nebraska, California, and other states, however, confirm that poor instructions are indeed a widespread concern.

Ham talk also seems to document that most of us select our gear without giving much thought—perhaps no thought at all—to the effectiveness of the printed instructions that come with our purchases. Yet it is obvious that

good instructions can make assembling and operating a unit easy, fast, efficient, and safe—a pleasure to own.

On the other hand, poor instructions can cause delays, waste efforts, spark frustrations, increase costs, produce errors, ruin equipment, and create dangers. In extreme cases, injuries can result.

From my unpleasant struggles with poorly written instructions have come 10 key questions that can help all hams select their gear more intelligently. Along with these questions are specific examples of poor instructions that accompanied ham gear sold in the past year. By now, however, at least some of the problems—it is hoped—may have been corrected. Therefore, the names of the offending companies are not mentioned.

1. *Can you read the instructions before you buy the gear?*

The manager of the Cupertino, California, store told me, "Take all the time you need." On the other hand, when I phoned cross-country to ask a manufacturer of antenna towers for a copy of the instructions for putting up one of its towers that I was considering for purchase, the chief engineer told me, "We don't lend or sell copies of our instructions. You'll get them when the tower's delivered." By then you are of course pretty much trapped into

using the instructions, bad as they may be; it's clearly not practical to return a tower that can cost several hundred dollars for shipping alone.

2. *Do the instructions make sense?*

Some ham gear comes with instructions that are clearly impractical, unrealistic, even downright foolish. An overstatement? Consider this example.

This farce was included in the 15-page *Instructions for Installation and Operation* for a nationally advertised antenna tower. The purchaser was instructed to lay a concrete foundation on which to raise the tower—a foundation 24 inches square and ten inches deep. That would be a block weighing some 500 pounds.

A few pages later, those same instructions told the purchaser that *after* the 480-pound tower was in place on top of that 500-pound foundation: *If tower is out of plumb, shift the concrete foundation block to bring it into vertical alignment, and then backfill firmly around the foundation.*

Can you imagine the struggle to try to prop up one corner of that 25-foot-high, 980-pound mass, or lowering another corner, to get the entire installation sticking straight up in the air?

3. *Are the instructions free of contradictions?*

Instructions that came with one "world famous" beam antenna warned, "Correct assembly and dimensional

adjustments are very important to successful operation." Later in those same instructions, the length of one part of an element was stated to be 51 inches; in a table that followed, the length for that same part was given as 50 inches.

Worse still, when I phoned the manufacturer to ask which dimension was correct, I was told, "Ohhh, yes ... we know about that error. But we haven't got around to correcting our instructions as yet."

Contradicting instructions also came with that infamous tower we've been using as a fine source of poor instructions. On one page the purchaser was told to place the "base hinge plate [which attaches the tower to the concrete foundation] hinge side away from the wall as shown on Detail FB." That "detail," a drawing on the next page of the instructions, showed the hinge reversed, its side toward the wall.

Later, those same instructions introduced two contradictions with one sentence. It said that the "pulley and safety rest have been inverted so that its [sic] arm will not project outward" during shipping, and therefore "must

be reversed as explained below." The instructions "below" never mentioned reversing the pulley; however, that made sense because the pulley arrived not reversed as stated, but welded firmly in position. And the safety rest, which the instructions said to "reinstall," arrived not installed in reverse, as claimed, but came uninstalled, in parts, unassembled.

4. Are the instructions free of unnecessary jargon?

The problem in trying to establish guides for this criterion is that language that is jargon to one person may be perfectly understandable to someone else. Furthermore, the more you read and use jargon, the quicker it may become understandable and therefore acceptable.

The first time I read the *Owner's Manual* for my new rotor control, I was confused by such jargon as "Rec Last," "SCAN then 7," "Counter Clockwise end travel," "access memory location #1," and many other expressions. But at this moment, after rereading the manual many times during the several months I've been using the control, I'm having difficulty finding examples of jargon in the manual; I've finally learned the language.

So try to avoid instructions that are jargon-packed, but also remember that those strange-sounding sentences will probably become clear to you as you re-read the instructions and work with the equipment.

5. Are the instructions specific?

The instructions for the winch that came with my antenna tower included this great line: *If brake disc mechanism operates intermittently or erratically, brake disc inspection should be accomplished.*

Ignoring that twisted syntax, I searched without success for instructions on how that inspection should be "accomplished." Should I dismantle the winch? Should I look for loose parts, dangling cable, or whatever? Well, I thought, *forget the inspection—how do I fix the winch when it operates "intermittently or erratically"?*

No instructions on that, either.

Other nonspecific instructions you should watch out for include such lines

as: "Adjust as may be needed." "Place in a suitable location." "Tighten as required."

6. Are the instructions clear?

The 30-page booklet that came with a nationally advertised rotor control unit included instructions not only for the model I bought but also for two similar but more sophisticated models.

If the instructions for those other models had been in separate sections of the booklet, there would be no confusion. But this instructional booklet intermixes directions for operating all these units. Often there is little or no indication that the instructions do not apply to my particular equipment. When I first read those instructions, I would suddenly find myself trying to learn how to operate features that were not on my model. Confusing indeed.

7. Are the instructions in a logical sequence?

I haven't found any manufacturer's instructions that say something such as, "But before doing that last step, you must ..." But some instructions come pretty close to such confusion.

Page 11 of instructions for assembling a beam antenna said to install screws, lock washers, and nuts on some straps. The instructions didn't state on which side the screws should be placed, yet in later steps the placement of that hardware became critical.

A very serious injury was almost caused by what was left out of another instruction. It said to "mount the balun clip to the circular boss." It did not include a warning that during the mounting, the clip might become loose and fly off at a high speed. It did fly off, hit me in the forehead, break the skin, and cause bleeding; if it had hit me just one inch lower, I would probably now be blind in one eye.

On the other hand, if you want to read instructions that are a model of logical sequencing—indeed, a model of the ideal instructions by almost every criterion—look at a Heathkit manual. Each of the more than 25 Heath manuals I've used starts with an "introduction," a brief overview of the purpose, use, and features of the unit. Next are tips for "Unpacking," to make sure you do not mix parts intended for

☐ 1. Can you read the instructions before you buy the gear?

☐ 2. Do the instructions make sense?

☐ 3. Are the instructions free of contradictions?

☐ 4. Are the instructions free of unnecessary jargon?

☐ 5. Are the instructions specific?

☐ 6. Are the instructions clear?

☐ 7. Are the instructions in a logical sequence?

☐ 8. Are the instructions free of any "surprise instructions" that may come after you've ordered the gear?

☐ 9. Do the instructions include a phone number you can call for help—ideally, an 800 (toll-free) number?

☐ 10. Are you confident the instructions tell you everything you need to know?

Table 1. Judging instructions for ham gear check-off list. When evaluating the instructions that accompany ham gear you are thinking about buying, check off each item above to help you decide if the instructions are effective.

one board, for example, with those to be used on some other board. Heath manuals also present "Assembly Notes," hints on tools, identifying parts, soldering, and such.

Then come detailed step-by-step assembly instructions presented in a very logical, clear-cut sequence. There's a check-off system to help ensure that you install each part correctly. There are numerous drawings, enlarged drawings of small units or more difficult steps, and photos. Many parts are identified four ways: by Heath part number, circuit component number, electronic values, and by a description of markings.

Final sections of Heathkit manuals present operating guides, procedures, "In Case of Difficulty," specifications, circuit description, schematic, and other details. Unlike some other instructions, you'll rarely need to search back and forth through Heathkit manuals for an out-of-sequence step.

8. *Are the instructions free of any "surprise instructions" that may come after you've ordered the gear?"*

"Surprise instructions" are such unrevealed details as additional equipment that may be needed, restrictions on use, limitations on locations, unexpected safety recommendations, unmentioned delivery problems, and such.

About a week after I'd ordered that infamous tower—but *before* the tower was delivered—I received in the mail three additional instructions from the manufacturer—details I'd not been told about before ordering the tower.

One instruction was printed in brilliant red on bright yellow paper. Across the top of the page, in letters a half-inch high, was the word "Warning!" Then came these statements (among others):

- Be sure to check your shipment carefully before acceptance.

- All shipments are made at the risk of the purchaser and (name of the tower) will not be responsible for shortage, loss, or damage occurring in transit.

As fate would have it, the antenna was delivered during a heavy rainstorm. But even without the rain, you can imagine the problem of trying to get a big and busy truck driver to wait

as you unpack, count, and inspect some two dozen parts ranging from 20-foot tower sections to 1-1/4 inch cotter pins.

A second page of surprise instructions came only after the tower was ordered. It was titled "Duty of consignees to accept freight even though damaged." It presented four long paragraphs of quasi-legal statements claiming that if what I'd ordered was delivered in a damaged condition, I had to accept it no matter what! The final point in those instructions: If the gear arrives damaged, "it is decidedly to [your] advantage to either repair [it] and file claim for cost," or "to sell the merchandise 'as is'" and then "file claim for the loss suffered."

Sure enough, the gear arrived damaged. I phoned the manufacturer and firmly pointed out that while such a provision might be enforceable in the state from which the tower was sent, it probably could not be enforced under the laws of the state in which it was delivered. The manufacturer backed down immediately and sent replacement parts.

Another example of surprise instructions came with a beam antenna. It was not until page 16 of the instructions—just as the antenna was about ready to be raised—that I was told I'd need a 3- or 4-foot mast ("not supplied") to use in finding the "balance point" of the antenna.

While many hams have hefty stocks of such supplies stored at their QTH, I don't. The result can be an unexpected dash to the hardware store, inconveniently and unfairly delaying friends who have gathered to help raise the antenna. A minor point? Perhaps. But why shouldn't all instructions present—right at the start—a list of everything you'll need to complete the project?

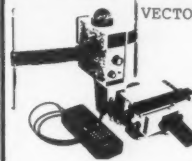
9. *Do the instructions include a phone number—ideally an 800 (toll-free) number—you can call for help?*

If the instructions you're evaluating don't give a phone number, there are three steps to getting information you need.

First, of course, phone the store from which you bought the unit. If the staff there can't give you the information you

Continued on page 38

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Instruction Instructions

continued from page 37

need, then phone the corporate headquarters of the manufacturer of the gear. Ask for "customer service" or "the expert" on the gear that has the problem instructions.

If you still don't get the answers you need, don't hesitate to phone the president of the company. It's been my experience that a surprising number of top executives are readily available and will have the information you need sent to you quickly. Indeed, I find that the president's personal secretary (but often no one less) also will get you answers promptly.

The doubter asks, "What about the extra cost for the phone calls?" Even several cross-country calls cost but a tiny percent of the expenditure you are considering investing in the gear. Besides, you may be lucky. When you call, the key person may not be in, so you can leave a message asking him or her to return the call to you; then the cost is on the company's bill. Presidents, in particular, I notice, generally return calls promptly.

10. *Are you confident the instructions tell you everything you need to know?*

This question is obviously difficult to answer—perhaps impossible—until you are actually trying to follow a set of instructions. Still, there are a few precautions you can take.

First, you can try to find some other ham who has used the gear, and ask him or her how complete the instructions are. You might have used another set of instructions, for some other gear, put out by the same manufacturer. Check these; the chances are that if a company has prepared clear-cut, specific, valuable instructions for one of its units, then instructions for its other gear are likely to be effective, too.

Another possibility: Compare the instructions with those prepared by another company.

As a last resort, you might ask a salesperson or a manufacturer's representative if the instructions include all the information you'll need. It's not likely they'll tell you about any shortcomings, but if they say, "Yes,

the instructions are complete," and you find later that they are not, you may have a bit more clout in trying to get the additional information you need.

In sum, as you consider the purchase of any piece of ham gear, you should be able to answer "yes" to all, or substantially all, of the above questions to help ensure that the instructions for the equipment are effective. If you must answer "no" to more than a few of those instructions, you might well shop around for some other unit that may have better instructions.

Realistically, many of us don't want to reject buying a unit just because the instructions are poor. So if you find good gear with poor instructions, you should certainly contact the manufacturer to try to get clarifications.

Still, one key problem remains: Many instructional guides seem clear-cut and easy-to-follow when you're considering the purchase, but later, when you're assembling, installing, or operating the gear, you may face doubts, questions, and confusion.

Unfortunately, shortcomings in instructions for ham gear will very likely continue until hams themselves unite to tell manufacturers that their instructional manuals must follow specific criteria. Until then, we'll have to continue to depend on the ancient Latin proverb *Caveat emptor*—Let the buyer beware. 73

Radio Fun in the Sun

continued from page 33

battery's state of charge as a function of terminal voltage. Another expanded voltmeter is discussed by Mike in his December 1991 "QRP" column on page 69. The December 1992 issue carries a complete feature article about an Expanded Scale Voltmeter.

Of course, this list is only the beginning: There are a myriad of simple—yet useful—station accessories just waiting to be included.

A portable, solar-powered QRP station, such as the one described in this article, can provide many hours of enjoyment while you build it, not to mention years of operating fun after. And,

of course, Ol' Sol will provide the operating power as well as those great spots for DX propagation. 73

Bend and Brake

continued from page 34

- The stock guide was installed on the wrong side of the tool (on the right side instead of the left side).

- The back gauge assembly is flimsy, and mechanically awkward. I simply removed it, and found it better to rely upon the precision of a scribed line. However, if you are cutting a large number of items to precisely the same length, the back gauge will prove helpful (and once set it will provide reasonable accuracy).

- While the shear is advertised to accommodate stock up to 12 inches wide, this is only true for the very thinnest of materials. For example, the shear would only accommodate an 11-3/4-inch piece of standard paper card stock. For 1/16-inch PC board the width is limited to 10 inches.

I called Harbor Freight's technical support group about these problems, and while they were polite, they said there was nothing they could do about it, and I could return the tool. But I was so pleased with the overall operation of the tool, I repositioned the guide myself; this involved laying out the two new holes using a high-quality combination square, center punching, drilling and tapping. It now works perfectly.

There is another prudent limitation for this shear: Except for very small pieces of PC board (two inches or less in width), the maximum thickness of the PC board should be limited to 1/16-inch.

In summary, the shear-brake is a very useful tool for any serious amateur builder, small laboratory, or amateur radio cooperative. I grin every time I use it, because I remember the crude hacksaw cuts and the tedious filing that I no longer have to deal with. The Central Machinery 12-Inch Shear, Press Brake, and Slip Roll is available from Harbor Freight Tools. The item number is 35969-2AAB. Their number is (800) 423-2567. The tool (which normally sells for \$200) was priced in the latest catalog I saw for \$180—and Harbor Freight will pay the shipping! 73

Ham Station Control and Monitor

You can do without this handy project—or can you?

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Salinas PR 00751-0030

The accessory described here is designed primarily for QRP home stations, but the methods used are applicable to QRO stations as well. All stations that use a storage battery of any type for backup power in case of loss of AC or during brownouts will find this design very handy. And even if you don't use a battery backup, you'll find it very useful because it does so much so simply.

What it does

Normal operation of two separate transceivers, such as one HF and one VHF/UHF (or any combination), will normally use the AC-operated power supply (PSU) for operation. If a backup battery is used, it will be on float charge at all times the AC power supply is in use, and totally disconnected at all other times. QRPers like to keep their small gel cell batteries topped off for quick use in the field or in emergencies. And in case of power loss, a quick flick of one switch connects the storage battery to supply 12 volts to the station to keep it operating. This unit is also fused for protection.

A surplus meter mounted on the panel, in conjunction with a 2-pole 3-position

rotary switch, allows rapid checking of DC voltage and current. The third position of this switch performs some RF magic and allows easy setting of the antenna tuner (ATU) for maximum output power simultaneous with the absolute minimum SWR the ATU is capable of producing. This proves your RF power is radiating, eliminating the need for an SWR meter and a field strength meter (FSM) at the operating position. More about this function later.

Provisions are incorporated to switch both audio out and key line input from your choice of two rigs to jacks on the panel for speaker and key. A headphone jack is included and mutes the speaker when the phones are plugged in.

The main DC line is heavily bypassed, both where it enters from the station power supply and at the multiple DC output connectors which provide power to both transceivers and all accessories. This precludes any electrical hash being transmitted between power supply and rigs.

As designed, operating voltage is indicated on a suppressed-zero, expanded-scale meter for the best accuracy. Even very small voltage changes will be easily noticed.

What it has in it

Not much, really—just mainly inexpensive connectors, three switches, surplus meter, three diodes, and a very few resistors and capacitors. Refer to **Fig. 1**, the schematic diagram, for the complete picture.

The cost to build this unit using all new (surplus) parts will easily be less than \$30, not including the enclosure. In fact, most hams will have all or most of the parts in their junk boxes. If a suitable-quality meter is missing from the junk box, do not despair. You can get five high-quality surplus meters for only \$10 from Fair Radio Sales Co., P.O. Box 1105, Lima OH 45802; (419) 223-2196; catalog number 47-84. Shipping is extra. Although the choice of the meters you get is theirs, not yours, at least one meter, and probably two, will be exactly what you need to build this unit. Too, you will have four nice meters left over for other projects.

Making your meter read volts and amps

For a comprehensive but simple and understandable description of how to
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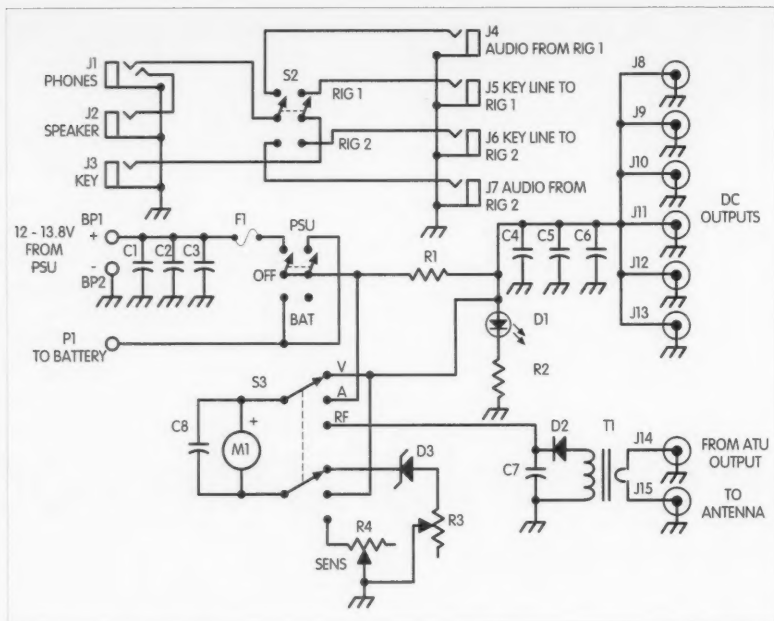


Fig. 1. Schematic diagram. Note: The following components should be placed on the front panel: J1, J3, M1, R4, S1, S2, S3. Remaining connectors should be mounted on the rear deck.

disassemble (to remove shunts, rectifiers, and multipliers, or change the scale), reassemble, and measure meter movements, please refer to my article, "Use Those Surplus Meters," 73 *Amateur Radio Today*, January 1992, page 42. If you don't have or can't locate a copy, you can order photocopies of articles or back copies of the magazine direct from 73.

However, I'll give you some quick and simple methods for making your meter into a suppressed-zero, expanded-scale voltmeter, and how to make a shunt so that it will indicate over the desired current range.

You must know the resistance of the meter movement, the full scale current, and the voltage drop across the meter movement at full scale, but these are easier to determine than you may imagine.

First, measure the resistance with a DMM on ohms scale. It might be anything between 2 and 2000 ohms. If it is much higher than 2000 ohms, it probably contains an internal voltage multiplier and will have to be taken apart to have the multiplier removed and replaced by a short wire, or simply shorted out with a piece of wire. Or, you may have another meter that will work just as well.

Caution: Do not ever use an analog VOM on ohms to measure meter resistance! The VOM voltage and current are so high that it can wrap the needle around the pin or burn out the movement of your meter. Use *only* a DMM!

In many instances, the full scale current is printed on the meter face. Ignore whatever scale the meter has. Look low on either side of the movement through the front glass of the meter. It is usually on the right side. Look for very small print such as: "F.S. 50 μ A" or "F.S. 1 mA." If it isn't present you can do it the hard way, with a flashlight battery, potentiometer, and DMM set to measure current. When the needle on your meter is at full scale, *write this value down and save it!* Make sure you also wrote down the meter resistance. You will need this figure later, too.

Now, using Ohm's Law, meter resistance and full scale current, determine the voltage drop across the meter. *Write this figure down and save it.* You'll need it later as well.

Suppressed-zero, expanded-scale

A zener diode, D3 in **Fig. 1**, is used to suppress zero so that the meter cannot

indicate until the zener voltage is reached. Because your operating voltage is usually 12 to 13.8 VDC, and a fully discharged storage battery has a terminal voltage of 10.5, an 11-volt zener is recommended.

Assuming an 11-volt zener is used, and 16 volts is a bit higher than any you will use in the station, what you will have is a 5-volt meter that measures only the five-volt span between 11 and 16 volts. Using Ohm's Law and the full scale current of the meter, determine the value of the meter multiplier resistance.

As an example, assume your meter has a full-scale current of 500 μ A (0.0005 A) and you want to measure the above mentioned voltage range between 11 and 16 volts:

$$R = E/I = 5/0.0005 = 10,000 \text{ ohms.}$$

You would probably use a 10k trimpot in series with 2k or 3k fixed resistor for R3 in **Fig. 1**. Applying 16 volts across the meter, D3 and R3 in series, adjust the trimpot for a full-scale indication on the meter. Or simply measure the voltage of your station power supply fed across this series arrangement and adjust the trimpot so the meter indicates the same as your station power supply does.

Making the shunt

Now you will need the full-scale voltage drop you measured earlier. But first, what is the actual maximum current either rig is expected to draw? Add one ampere to this figure, round it off at the nearest higher figure, and write this number down. Assume your final figure is 5 amperes.

Now pull out the *Handbook* and look up the copper wire table. I'll tell you now that AWG 22 is fine for a 5- or 6-ampere shunt. Look over across the table under "Ohms per 1000 Feet." Divide this down to determine the resistance of *one inch* of AWG 22 wire. It happens to be 0.0013 ohms, and four decimal places are more than sufficient to guarantee reasonable accuracy. With these two figures, and the meter movement voltage drop at full-scale, you will do a tiny bit more arithmetic. Assume meter voltage is 0.044V.

Parts List	
Designation	Part
BP1	Red binding post
BP2	Black binding post
C1, C4	.001 μ F ceramic disc
C2, C5	.1 μ F ceramic disc
C3, C6	10 μ F 16 V tantalum (or 100 μ F aluminum electrolytic)
C7, C8	.01 μ F ceramic disc
D1	LED, green
D2	Germanium: 1N34A, 1N60, 1N270, etc.
D3	Zener diode, 11 V, 400 mW (see text)
F1	Fuse appropriate for current drawn
J1-J7	3.5 mm mono phone jack or your choice
J8-J13	DC connectors, your choice
J14, J15	SO-239 or your choice RF connectors
M1	Meter, 50 μ A to 1 mA (see text)
P1	Connector to storage battery if used, your choice
R1	Shunt (see text)
R2	2.4 k 5% 1/4 W
R3	Trimpot voltage set (see text)
R4	50 k pot. RF sensitivity.
S1	DPDT center off toggle, must carry full DC current
S2	DPDT toggle
S3	2-pole 3-pos. rotary
T1	T50-2 or T50-6, 30T AWG 24 secondary. Primary is straight wire through center of core, J14 to J15

Table 1. Parts list.

$R(\text{shunt}) = .044(V)/5(A) = .0088$ (ohms).

Now, to determine how many inches of AWG 22 wire you will need for your 5-ampere shunt, use the following:

$L(\text{in.}) = 0.0088/0.0013 = 6.769 \text{ in.}$, or a bit over 6-3/4 inches.

You can now cut the wire a half-inch longer at each end for connection, wind it over a ballpoint-pen body, slip it off, strip and tin the half-inch ends, and solder it to a 2-terminal strip. Small stranded hookup wire is used between the shunt and the rotary switch contacts.

RF magic

The simple circuit composed of C7, D2, T1, J14, and J15 is essentially identical to that I described in my article, "Home-Brew RF Ammeter for the Shack," 73 *Amateur Radio Today*, July 1998, page 29. The article thoroughly describes how it functions and why it can tell you when your RF output is as high as possible, simultaneous with an SWR as low as your ATU can get it. Because it also shows you the relative RF power going into the shack ends of your feeders, you know the antenna is radiating it—so you no longer need an SWR meter or FSM in the shack. Just adjust the ATU for the highest peak on M1 with S3 in the RF position. I incorporated this circuit into this design to make it even more valuable as a necessary part of my ham station.

A final word

All wiring that carries the full load of current should be at least AWG 14 for up to 5 amperes or less, to reduce voltage drop through the wiring. If your station is QRO you will be using larger wire—at least AWG 12.

I operate only QRP and have two main rigs, an SG-2020 and a QRP++ as a backup. Both these rigs are controlled and monitored through my Ham Station Control and Monitor, and my backup battery is a 12-volt 12 Ah gel cell.

I built this unit in a Ten-Tec TG-36 that I bought on sale a couple of years ago. It measures approximately 6" W x 3" H x 4" D and matches all the rest of my home-brew accessories and test equipment. I also have several mono-band CW transceivers, and when I want to use one, it is easy and quick to plug one in to temporarily replace the QRP++. Of course, it would be simple to expand this unit to handle as many as four separate transceivers. Above

that number, the needed toggle switches probably are not even manufactured.

For those of you with HF rigs interested in the HF satellites, having two rigs ready at the same time with one on 10 and one on 15 meters would allow you to have a pretty inexpensive satellite station! It's a thought.

73

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Restoring older multimode radios for microwave IF systems

Have you ever been presented the opportunity at a flea market/swap meet to stand in front of a multimode 2 meter radio that did not cost several kilobucks? Well, enter the realm of older, more classic radios that contain an unusual component—a power transformer. Yes, they do exist, and not all of them run off +12 volts directly.

I remember back even further into the Swan and Atlas earlier days, when the only thing transistorized in the entire radio was the VFO circuit. All other components were electron tubes and their associated circuitry, along with the internal AC power transformer. Many of these old workhorses still can be very useful, simple, and possibly inexpensive transmitter/receiver setups for an HF or VHF station.

There are probably more HF radios around of various makes and quality, from simple CW-only rigs to some of the more advanced units that sport SSB operation. The golden rule is that as long as the chassis is not corroded or rusty, restoration should not be a difficult project. The pursuit of antique radios capable of CW, AM, and SSB is fun, and the operation of a classic-style station can have its rewards.

I have good hunting grounds here in southern California for finding many of these older radios, partly due to the fact that several manufacturers were located about 40 miles north of my home here in San Diego. Swan Electronics, later to become

Cubic Electronics, along with Atlas Electronics in Oceanside CA, and Southcom in Escondido, and a few others provided amateur and military communications equipment. In those days (1970s), we could dig into the surplus material from manufacturing and try to assemble enough parts to assemble a complete HF transceiver.

Well, today, years later, the parts are not available like they used to be, but the radios still surface at flea markets and swap meets to tempt our desire to give them another breath of life. What, then, can you resurrect from these older radios, especially the early solid state 2 meter multimode rigs of many years ago?

The popularity of these early multimode radios is not high, because they are devoid of tone control to access repeaters while using FM operation. All the other basic functions such as repeater offset and simplex operation may be standard, but these are the only frills found in these early radios. SSB, CW, and AM operation are normal, in addition to FM, making for a full function radio still quite useful. Yes, you can add an outboard tone control to make use of these radios on repeaters, but I suspect that most of us have a more versatile 2 meter FM radio for that function.

My eyes usually see a great and inexpensive IF system for use with a microwave converter. This option allows simple modifications to customize a transceiver for converter use without spending a lot of hard-earned bucks. Besides, who wants to cut into and modify an expensive

newer multimode transceiver just for a microwave converter IF system? Sure, I have some real classy multiband, multimode transceivers, but I would not think of modifying my ICOM-820 2 meter-3/4 meter multimode radio for an IF system. It cost too much and works just fine as it is.

The swap meet/flea market source is usually a very inexpensive one for these older transceivers, and the cost paid usually will not put a crunch in your budget. Depending on condition and a few other things to watch for in evaluating a swap meet rig, I have found the price to be in the \$100-or-less price range.

As an example, while writing this column I decided to see if I could follow my own advice and try to find a 2 meter multimode radio to restore for use as a microwave IF system. It took about 2 weeks, but at our local electronics swap meet I found a 1970s solid state Kenwood TS-700A 2 meter multimode radio. Now comes the wrangling and reasoning between buyer and seller. The seller wanted big bucks for the radio and would not negotiate to something reasonable.

Here is where the rock and the brick wall can form a formidable obstacle if reason doesn't take place. First, if the radio is equipped with microphone, power cord, and manual, and all are presented in a neat package, possibly with some modification equipment the owner has invested in, it might take more bucks to loosen the grip on this radio than the original estimate of \$100.

However, if the radio is sitting on a box with an accessory cord cut off short and no accessories or even a schematic or microphone, there is room for haggling. Try asking how the radio functions and if the seller has the accessories. If there are no accessories, the radio just as well could be dead or alive—it's in an unknown condition. Now there is some room for haggling on the price to reach a mutual understanding.

If it's still on the high side or top dollar is wanted, see if you can try it out and get a refund if it's dead. If that doesn't work, make an offer at a lower figure if you're still interested, considering that both of you are looking at an unknown piece of equipment and the lower price might be a better compromise for both of you.

In my case, this exact scenario resulted in a reduction from \$150 to \$90. The Kenwood TS-700 looked in clean condition (dusty from a poor storage or operation environment), but otherwise it was basically intact and without any accessories.

Now, on the bright side of things I knew before I purchased this radio that I had a copy of the manual in my file cabinet at home from a long ago repair job for a friend, a plus from the start (if I could find it).

Well, getting home and powering up the radio proved troubling at first. The radio powered up OK, but most of the pilot lights were burnt out on dial indicators and knobs, making nomenclature difficult to see. It transmitted OK, but on closer examination was on frequency at the first 100 kHz of the VFO range and then went off into the blue as the VFO frequency was raised 300 to 500 kHz higher. The spectrum analyzer showed the radio trying to function at 120 MHz rather than 144 to 148 MHz. Additionally, the receiver on FM was dead, although SSB, CW, and AM (yes, AM) functioned but had the same frequency disparity on transmit.

After a few hours not totally devoted to this project, I determined the VFO and crystal oscillator mixer circuit to be the culprit. The VFO tuned a 1 MHz portion of an 8 MHz frequency and was mixed with a crystal in the 120 MHz range along with a 10.7 MHz IF to produce 2 meter frequencies. My trouble was the VFO itself, as it died between +200 kHz and +900 kHz of its 1 MHz tuning range. Outside of this range, it functioned OK. I dreaded pulling the

VFO, as it meant removing the front panel and using probably two packages of stickers to identify leads that would have to be lifted to gain entry into the shielded VFO compartment.

I went to bed thinking about how to fix the VFO with external units or whatever. Playing with the radio the next morning, I discovered that some frequencies higher in the VFO tuning range would pop up and function normally for a short time. On extended evaluation, it was determined that the VFO mechanism must have been a sort of roller inductor. Its operation was slowly restored by rapidly rotating the VFO dial back and forth until I got tired of turning the dial back and forth about its full range.

The internal mechanism must have had a corroded or dirty contact surface that was restored by rotation of the VFO tuning dial. The operation very similar to when a dirty potentiometer needs the same contact surface cleaning. After this wiping action, total restoration of the VFO dial calibration was observed (very lucky here).

Further examination led me to use a small, soft brush to remove

a layer of dust and soot that had built up over the years on top of the inside PC boards of the radio. It seemed that the radio had been in a hostile environment for some time, and sawdust and other stuff had been allowed to settle through the vent holes in the top of the radio's cabinet.

Well, all this cleaning up and repair proved that I had made a good purchase of an inexpensive multimode radio. Sure, it needed some tender loving care and touch-up. But compare that investment to purchasing a new multimode radio, and I am sure you then might want to take the plunge to restoring an older radio, possibly saving quite a bit, and investing in your repair ability.

Now that (in my test example) my old 2 meter multimode radio is functioning, some modifications need to be made to make it suitable for microwave converter operation. The most important modification can take one of two turns. One is the reduction of the high power transmitter output to a lower level more suitable for microwave mixers. With a radio capable of outputting 10 watts of power, either a high power attenuator or RF antenna switching modification

must be provided for. Another possibly simpler modification is to make an attenuator of very low power ratings out of 1/4 watt resistors and place it in the driver-to-final amplifier circuit.

To me, a modification using only three 1/4 watt resistors seems least intrusive and very simple. It involves unsoldering one coax cable center conductor in the amplifier compartment and inserting the attenuator between the unsoldered pin and now-loose coax center conductor and ground. I constructed a 15 dB attenuator and reduced the final value to obtain 100 milliwatts of output RF. This 100 milliwatts (+20 dBm) of power is more suitable for most high level mixers. In my case, my 10 GHz converter is located over 100 feet from my ham shack. Even considering the feedline loss and 10 dB protection attenuator before the mixer at the converter, it still provides a good +10 dBm for mixer action.

Loss Pad	R1	R2
5 dB	14 Ω	82 Ω
10 dB	26 Ω	35 Ω
15 dB	35 Ω	18 Ω
20 dB	41 Ω	10 Ω

Table 1. This is a chart of different attenuator resistors should your circuit need a different dB loss pad. See Fig. 1 for R1 and R2 pad resistor values. Use 1/4 watt carbon resistors. While values quoted are not standard, approximate values will work quite well.

At this low power modification level, the last thing you want to do is overpower a mixer. These mixers are the precious items used in constructing converters for our upper microwave bands. As such, whatever protection you can give them through modifications such as power reduction of transceivers makes

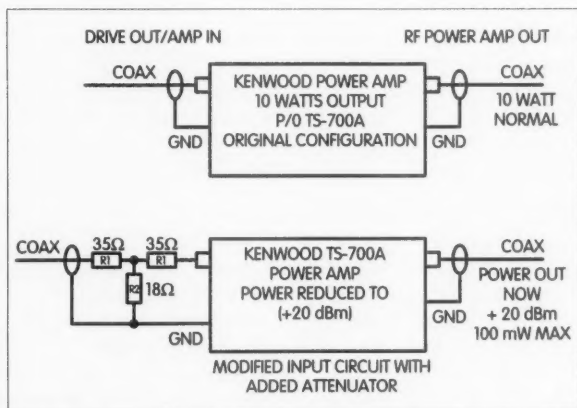


Fig. 1. Low power modifications shown in the driver-to-final amplifier compartment in the Kenwood TS-700A 2 meter multimode transceiver. Just a simple 15 dB attenuator constructed from three 1/4 watt carbon resistors completes the modification. This reduces power to the (+20 dBm) 100 mW maximum power output from the transceiver. This low power range is suitable for use with a high level microwave converter mixer circuit. If using low level mixers (+10 dBm), increase pad to approximate 20 dB loss for these mixer circuits.

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It is quite interesting to write about preparation for a particular disaster rather than disaster preparation in general. The Y2K bug presents us with this unique opportunity to focus on a particular emergency with certain expected outcomes and an assumed time frame. So, assuming that the Y2K event requires our assistance, what should we be doing to prepare?

Operators

Determine who will perform various key functions, especially command and control. Key functions include net control, liaisons with various agencies, who will be assigned various locations, etc. In any disaster, it is key that the served agencies know who their assigned hams are and what they are prepared to do. For many agencies, these people must be pre-approved by the served agency. Police departments routinely require background checks before granting access to internal areas of their facility. Such access is only available to those

with identification cards issued by the department. Now is the time to determine what your served agencies require and take care of the requirements now. Incidentally, don't be surprised if a served agency wants the hams to operate the agency's radio equipment rather than use amateur gear. Determine what the requirements will be, and then determine how communications needs will be met if the primary systems should fail.

Don't think of backup systems only in terms of equipment. In any situation that lasts over a few hours, people will need to be relieved and replaced. Some may be able to take time off from work to assist, but that will be for a limited period. People who are available or who have flexible schedules cannot work indefinitely. Assign a second duty section to relieve the first responders with some planning as to when this should occur. Interestingly enough, it may be prudent to hold some of the key operators back for the second wave, since the immediate

responders may spend some time in the "hurry up and wait" mode while the overall situation is assessed and others switch from routine to disaster mode. Also, some hams need to be kept available to be assigned as needed for those unexpected "other duties as assigned," provide transition coverage, etc.

Frequencies

Determine which frequency (or more likely, frequencies) will be used. Do all the involved hams know the frequency to which they should report? While it is possible to have all hams report into the main frequency (sometimes called the backbone net or command net), it may make sense to have them report to a secondary one. While support communications is underway on the main frequency, operators can be checked in and given their assignments and frequencies on another. This makes the hams' organizational efforts transparent to the served agency.

Often the primary frequency is a particular repeater, but that repeater may not be available. Do the local hams know what alternate frequency to use if the repeater is unavailable? In my area, there is a very fine repeater that I expect will be functional on New Year's Eve. It is also the target of malicious interference so that even if it works perfectly, it may not be useful. If it is not available, valuable time can be lost while people search for the

emergency net. Depending upon the needs of your served agencies, you may need to plan for a number of local frequencies. In a typical emergency, these may include some of the following:

1. Command and control
2. Amateur operator check-in
3. Shelter communications
4. Inter-agency liaison
5. Disaster assessment or other on-site communications
6. Frequencies for each particular served agency
7. Relay frequencies

In addition, with current technology the following frequencies may need to be designated:

1. Packet or APRS in support of the emergency
2. ATV

There would also be the potential need to communicate outside the local area via the HF bands, but that would follow behind the local operational requirements. These would include:

1. Requests for materials and supplies
2. Coordinating efforts over larger areas
3. Health and welfare

One of the problems frequently encountered in emergencies is the loss of a particular local frequency. In most cases, this is coincidental with the loss of a repeater. While the loss may be catastrophic, it usually is due to either the loss of backup power or pure overcrowding. This is one reason that alternate frequencies are so important. It is better to split the communications among several frequencies

good engineering sense. I have always felt that it was unreasonable to generate all that 10 watts of power only to use a high power attenuator to reduce it.

Besides, reducing the power beforehand saves in power supply heat through lower current required to function. Making the rig run cooler is another big plus in overall operation.

Was the old rig restoration work worth all the fuss I went through? You bet. Not only did I get a good unit back in service


and fully restored through the application of a little elbow grease, but I also saved the ICOM 820 for other uses and enjoyment. I think it would be pound foolish to modify such an expensive quality multimode radio just to use for a converter application.

There are many other types of 2 meter and even 450 MHz radios that will fill the bill. For instance, the Yaesu FT-480 and FT-780; the ICOM IC-211, IC-245, and IC-260; and for SSB

only, the IC-202 and IC-402. These are just ones that I have observed in common use here in southern California. Power modifications and operation will vary, of course, on different units; each will have to be evaluated on an individual basis.

Next time I will cover some of the fine points on the IC-202 SSB VXO-controlled 2 meter transceiver. This unit is another natural for microwave converter use. A bonus point on this radio is that it has a direct readout

mechanical dial that is visible even in bright sunlight.

Here's good hunting at swap meets and flea markets in your quest for that bargain multimode transceiver. Just try to avoid paying too much without full knowledge of what you are getting into with a questionable radio. If the price is low or a big bargain, I would take the plunge and give it a try. After all, we are trying to shop at bargain prices and save some bucks. Best 73 and good hunting, Chuck WB6IGP. 

than try to run everything through a single frequency. Another basic to remember is that although there is a desire among hams to get on the air and talk, during an emergency the less said, the better. If you have something important that needs to be transmitted, then send it. Otherwise, it's best to monitor only. This extends the life of the battery in your handie-talkie as well as the repeater if it's running on battery power. It also keeps the frequency available for critical traffic.

If there are power interruptions, repeaters will only work so long and then their backup power will be exhausted. When that happens, it may be necessary to provide wide area coverage by other means. At least some of this can be addressed prior to January as part of the planning process. In most cases, the population centers will be the areas that need to be served

as well as the served agency locations. Can these areas communicate directly on a simplex frequency? If not, what alternatives exist? There are several that can be included in the emergency planning:

1. Portable repeaters are available that can be quickly deployed. They may constitute a significant expense even though the repeater will rarely be used, but they sure can be useful. Since we cannot predict which repeaters will be operational and which might fail, these should not be rockbound to a given frequency and should be equipped with a good source of backup power.

2. Some radios can crosslink between 2 meters and 440 MHz to act as a repeater. Of course, it is necessary that the signal eventually ends up on a frequency that most involved operators can receive. This may involve converting from 2 meters to another

frequency band and then converting back to 2 meters.

3. Simplex repeaters are available that use a digital chip to store a message which is then immediately retransmitted.

4. As amateur radio operators, many of us are members of the ARRL. The third letter of this stands for "relay." In many cases, the easiest and most practical method of extending range when a ham who can copy the initiating station relays the traffic to another relay point or to the recipient. This technique,

while definitely low-tech, can be quite effective. I recommend that if significant amounts of traffic must be relayed, a relay frequency be designated.

If there ever is a time to plan on operating at the lowest level of power practical, this is the time. Likewise, placing a temporary or simplex repeater or a relay station in a good location can extend the life of the system. A system that runs out of juice before the operator needs to take a comfort break is of dubious value.

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for 73 Magazine."

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THE DIGITAL PORT

Jack Heller KB7NO
P.O. Box 1792
Carson City NV 89703-1792
[jheller@sierra.net]

My interest in the Creative Services Software programs mentioned last time was piqued when I received a message from Rick Ruhl, president of the company, saying that they not only were producing packages for Timewave products and Kantronics, but also developing Windows programs for MFJ, SCS, and Hal. I know there are hams interested either in alternatives to original packages or because they have acquired used TNCs with no software.

First, let me say that the software I sampled works and is easy to install. That last is important to most hams—we want to get the program plugged in and running so we can play. That is supposed to be the meaning of Plug 'n' Play, but all too often new software is dubbed "Plug and Pray" by the disgruntled would-be user.

And in the event you need help, the company has technical support to get you up and running. I was at an advantage because my old PK232MBX has been playing beautiful tunes for years. Communication between the computer and the '232 have long since been established. There are detailed instructions to follow when that is not the case, such as with a new unit/software combo.

Speaking of instructions, in my efforts to be thorough, I downloaded the operating manual and printed it. The manual formatted nicely for my Word program and turned out to be a 212-page document! I figured if there was that much to write about this program and the associated TNC, there must be something in there I didn't already know.

However, it turned out there was a lot of blank paper space and I would have been smart to edit out many of the page breaks before printing. I didn't do this because there is a nifty index in the back of the manual and I wanted the page numbers to be relevant. When I mentioned this to Rick Ruhl he explained their automated system brought the text forward from the help files and they have, since that time, edited the manual to a much shorter edition.

In the case of the PK232, there are a lot of parameters that may require tweaking for best performance (or any performance). The good part about setting up the PKTerm software is that it is practically ready to communicate with the AEA unit. During boot-up, it checks for the model of hardware and any built-in updates, so it "knows" what it is dealing with and adjusts appropriately.

There is a screen available when the packet screen is in view, known as the command box, that allows change of the parameters of the PK232. Somehow, I hadn't needed, and consequently hadn't noticed, this convenience until I was on the phone with Rick. It was sitting right there in plain view all the time, but only when the packet screen was up. The HF screen does not show this box, and I was more interested in the HF capabilities of the program.

One of the pleasures of using something new shows itself when it works "right out of the box." That is what the program did for me. There was one negative factor that I fixed. I later decided, while speaking to Rick,

that it must be a problem related to using the 256-color monitor. The problem was that the default font was very distracting to the eyes because the letters and symbols were just too "fat" and too close together.

These dinosaur monitors are becoming relics, and even I will have to upgrade sometime soon. Of course, bear in mind that not only am I frugal, but also it is only a little over two years since I decided that 16 colors weren't getting the job done.

A very nice feature of PKTerm99 made a myriad of fonts available as well as a selection of colors for background and text. After a little experimenting, I found that the "Courier New" font at 11 points was nearly ideal. I chose colors that were pleasing to the eye and the whole program looked much better. Even reduced the noise level of the user. This may be of interest to the frugal set.

There are 10 user-definable macros. I used two of them to write CQ files for PACTOR and RTTY. You can find a number of uses for macros. Most hams have a brag file to list their station equipment and, of course, macros are invaluable for contesters. They are easy to write or edit and available at the click of your mouse. The instructions include an example of writing a real macro that automatically plugs in information from the computer and your input to automate the first round of a QSO. A thoughtful bit of advice.

What I like about the macro pull-down is that it displays the descriptive title I gave the two macros I wrote. After a quick glance, I merely need to hit Control and a number key to bring the macro into the composition or "chat" screen. Very friendly.

I questioned Rick about the flagrant display of buttons for AMTOR instead of one of the more "advanced" modes. Then I mentioned to him, in almost the same breath, how I had recently heard a ham linked in AMTOR in just the past few days. Very unusual. Rick explained that

a lot of marine uses for the Timewave hardware still use SITOP, which justifies the prominent display of the old mode.

One of the pluses Creative Services Software has going is that they are working closely with the various hardware manufacturers such as Timewave. I accessed the Timewave Web page to see their positioning and found an announcement I had not considered, that the program is Y2K compliant. Nice to know.

This version of the program is said to work with most any current AEA/Timewave hardware or that which is expected to be still surviving. I saw model numbers listed that I was not aware of. So, if you have an old AEA unit you could find a use for, you should check the Web site of either Timewave or Creative Services Software. (See chart.)

Speaking of modern ham communications features, I have been using programs with DSP or working the '232 with the Timewave DSP-599zx hooked up. When I started testing this program, the 599 was not hooked in line. I wanted to experience the "feel" of the barebones '232.

There is a difference. I had to think back a bit to when I first started using the '232, about 9 years. It is old enough that I installed the '93 update that enabled the use of PACTOR. That, incidentally, seems to be about the time of the demise of AMTOR on the ham bands, which I mentioned earlier.

I still recall the thrill of making AMTOR links. I had previously worked some HF packet. Packet, keyboard to keyboard on HF, was never much fun because of the high collision rate. A packet could take five to ten minutes to gain acknowledgment. I don't know if anyone does that sort of thing anymore. I recall one such contact I made on 30 meters a few years ago, but it looks like the chief use of HF packet is for bulletin boards, and I see many HF BBSs are now using PACTOR.

I was curious about the HF packet ability of the PKTerm99 package. It wasn't evident that that was an option until I checked the help menu. There is a setup screen to change to 300 baud. Just a few clicks and I tuned one of the packet BBSSs and it copied. Good enough for me. I know it works.

Back to the DSP thoughts. For PK232MBX users, Timewave is providing an upgrade that adds DSP to this remarkable old workhorse. For about \$125, you can have the controller that does everything and pulls the weak ones out like never before. That is a must for this shack.

Even though I can run the Timewave DSP unit ahead of the '232, I am starting to be swamped with special cables and am forgetting, often, what goes where. Some pretty embarrassing mistakes are happening. That would clean up some of the mess. Of course, there is something to be said for neatly labeling all cables and making sensible notes, kept in a neat and orderly spot on the shelf (which is already inundated with previous attempts at orderliness).

A point of interest for PK232MBX users: If the software shuts down with the wrong parameters, another program may not be ready to pick up where the other left off. We get so used to so many software intense systems that seem to take care of themselves that we sometimes forget that the terminal node controller (TNC) "members" parameter variations we send to it via the software.

I have been using the XPWare software that I reported on in this column a good while back. These two programs don't mess each other up. That is good to know. It is also good to know that the problem can give you fits when installing a PKTerm99 as a replacement for some older software.

The previous software may have left your TNC in a disagreeable startup state for the new stuff. I didn't discuss this with Rick, because I had experienced no

Current Web Addresses	
Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
New Mode — PSK31 — Free download	http://aintel.bi.edu.es/psk31.html
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & DSP software	http://www.siliconpixels.com/
Timewave DSP & AEA products	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample download	http://www.goodnet.com/~gjohnson/
Auto tuner and other kits	http://www.lidgelectronics.com
TAPR — lots of info	www.tapr.org
Creative Services Software	www.cssincorp.com

Table 1. Handy URLs.

problem. So—I wouldn't accept this as a given, but I wouldn't be surprised if the PKTerm99 inserts the necessary parameters to establish the protocol between the computer and your TNC "no matter what." If you should experience a problem, this is what the tech support they offer is for. You will get it going.

The Kantronics version of the program is said to look and feel the same as the one I have just discussed. As a matter of fact, the intent is to make a user-friendly environment for the users of all the popular TNCs on the market, along with many of the older and discontinued units still in service.

Where credit is due

My first contact on the PSK31 mode, as reported last month, was with Bill WA4KBD. I am still indebted to Bill for his thoughtful insight concerning the new mode. Last month, I was away from home and could not recall Bill's call. When I returned home, I went to Bill's

excellent Web site at [www.missionradio.net] and retrieved the QSL he promised would be there.

I printed the "card" and it is excellent, especially when done in color. One more reason to set up my own Web site. I am just going to have to quit loafing, make up my mind, and do it. That QSL probably took very little more effort to post than a regular card, required no postage, and delivery could have been in minutes. Impressive.

So many toys—so little time

I mentioned last month that I

have a beta copy of the DSP (there's that stuff again) soundcard program from the author of ChromaPIX. I will get that up and running and tell you all the wonderful things I see (and don't hear) next month. This sounds like a real winner. I have a lot of questions about such a device and am anxious to see what Jim Barber has accomplished here.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130.1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO. **73**

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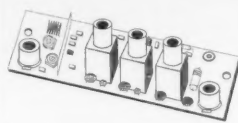


Soldering Catalog from Antex

A new catalog that features a full line of miniature and standard soldering irons, temperature control stations, and stands, plus a wide selection of

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For further information, contact M.M. Newman Corp., 24 Tioga Way, Marblehead MA 01945; tel. (781) 631-7100; fax (781) 631-8887; E-mail [mmn@mmnewman.com]; site [www.mmnewman.com].



New Hamtronics Preselectors

If you have intermod problems with a VHF receiver, Hamtronics may be able to help eliminate them! Adding just a filter ahead of a receiver may block the interfering signals, but it will degrade the sensitivity of the receiver because of its insertion loss. However, Hamtronics' new

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Natcomm MH-510 HT Tribander Antenna



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For further information, contact NCG Company, 1275 North Grove St., Anaheim CA 92806; tel. (714) 630-4541; fax (714) 630-7024; E-mail [micks@cometantenna.com].

Print Screen is Back!

New Print Screen Works software for Windows 95/98/NT lets users print, E-mail, or fax anything that's on their screen simply by pushing the long-dead Print Screen button. Once captured, the image can be printed or converted into a .bmp or .jpg file. It can capture images that fill the whole screen, the active window, or just a portion of it. Print Screen Works also includes a built-in Internet E-mail capability—you can send an image directly from your computer screen to anyone else's via E-mail. \$29.95.

For further information, contact SilverLakeTech.com, 55 Washington St., Bloomfield NJ 07003; tel. (973) 259-9300; fax (973) 748-3015; E-mail [joel@silverlaketech.com]; site [www.silverlaketech.com].

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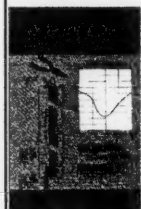
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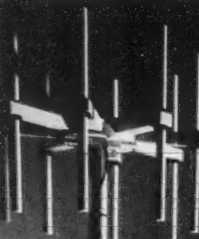
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CIRCLE 13 ON READER SERVICE CARD

Amateur Radio Via Satellites

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SUNSAT-OSCAR-35 is up and running, and sounds *great!* During the first weekend in July, ground controllers in South Africa configured the amateur-radio portion of S-O-35 for analog, cross-band repeater operation. They set the satellite for "Mode-B", with an FM uplink on 436.291 MHz coupled to an FM downlink on 145.825 MHz.

Since the launch of Stellenbosch University's new satellite on February 23rd, the students and supporters of SUNSAT have been busy checking out and calibrating the onboard systems, stabilizing the spacecraft and starting experiments. A detailed description of the satellite can be found in the June *Hamsats* column.

Less than a month after the launch, an historic contact between longtime project enthusiasts Garth ZR1AFH and Hans ZS5AKV took place via S-O-35. General ham activity has finally made it to the satellite's schedule, but the wait was worth it. The single-channel FM repeater on S-O-35 is fantastic.

While it can be set for two meters up and 70-cm down (Mode J) like A-O-27, it was instead configured like A-O-21 with a 70-cm uplink.

A-O-21 was a subsystem of RS-14. One of its many capabilities was to emulate a simple "bent pipe" Mode-B (70-cm up and 2-meters down), cross-band FM repeater. A-O-21/RS-14 is no longer on the air, but while it was active, the single-channel repeater mode became very popular since it could be worked with a dual-band handie-talkie. The same is true for S-O-35. The 70-cm receiver is quite sensitive and the two-meter transmitter's lowest power setting is one watt, still plenty of power for easy HT or scanner reception.

Due to power-budget constraints, the repeater can only be activated for limited periods. The students at Stellenbosch University run their experiments during the week and then, working with the satellite ground controllers, set up onboard timers for amateur-radio transponder operation on Sundays. The

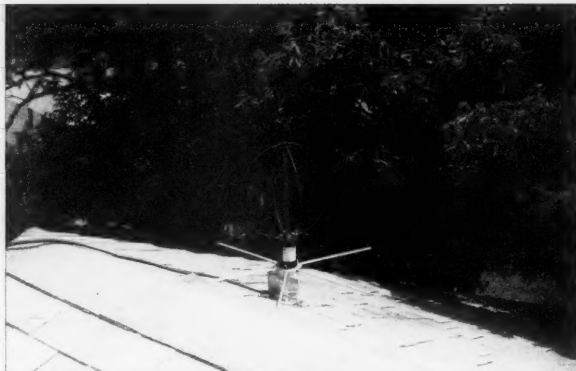


Photo B: Satellite antennas for the fishing trip were very simple. This 70-cm "Eggbeater" did well when used with a 2-meter Ringo Ranger.

schedule is usually announced via the AMSAT-bb E-mail remailer, (details on how to subscribe can be found at [<http://www.amsat.org>]) or on the SUNSAT web site [<http://sunsat.ec.sun.ac.za>].

When the transponder turns on, it starts with a stream of 1200-baud AFSK data on the downlink transmitter before going into voice mode. The repeater operation starts as soon as the data stops. Due to the complexity of the ham gear on S-O-35, the satellite can be moved to many different frequencies within the two meter and 70 cm amateur satellite bands. A single-frequency "parrot" repeater can also be activated on 145.825 MHz. It listens for eight seconds, and then transmits what it has heard for the next eight seconds. The cycle repeats for as long as the parrot is active. S-O-35 also has packet store-and-forward message capabilities. It may be a while before all of its systems have been tested, but it will prove to be a lot of fun for those that keep up with this fine hamsat.

Other portable pursuits

It has been said that all of our current hamsats can be worked with simple portable or mobile systems, with the exception of AMSAT-OSCAR-10. A-O-10 had its 16th birthday in June. The onboard computer is dead

and the satellite's attitude is uncontrollable, but when the solar panels are properly illuminated, the Mode-B transponder works fine for CW and SSB contacts. On a recent fishing trip, I decided to try A-O-10 with a Yaesu FT-847 and some very simple antennas.

For the 70-cm uplink a small M-Squared "Eggbeater" was placed on the roof. A Cushcraft Ringo Ranger (always at the lake house) was used for two-meter reception. While the satellite was at its high point, or apogee, signals were barely detectable, but during a low point, or perigee pass, reception was fantastic. A-O-10 sounded like a LEO (low earth orbit) hamsat, but even its perigee is much higher than the "tallest" LEO amateur-radio satellite. It's quite common to catch some good DX via A-O-10. With 10 to 50 watts out to the Eggbeater, voice contacts were easy, most with "armchair" copy. My car antennas would have worked as well, and an Arrow hand-held, dual-band Yagi would have outperformed both installations.

The popularity of the Arrow antenna continues to grow. This rather simple dual-band Yagi is designed with satellite chasing via AMRAD-OSCAR-27 as its primary use. The antenna comes apart very easily for storage and shipping. It is made of aluminum arrow shafts and is available with an optional low-power



Photo A: Andy W5ACM makes contacts via A-O-10 and other hamsats while on a fishing trip in central Texas.

CALENDAR

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the December issue, we should receive it by September 30. Provide a clear, concise summary of the essential details about your Special Event.

AUG 21

ITHACA, NY The Tompkins County ARC announces its 1st annual Finger Lakes HAM-IN (hamfest and fly-in) at Tompkins County Airport (KITH), 3 miles NE

of Ithaca. Large hangar for indoor vendors and displays. Paved outdoor flea market and parking. Airplane rides and aviation displays. Breakfast and lunch served. Admission \$5, under 18 free. Indoor tables \$10; outdoor

spaces \$2 each. VE exams, pre-registration preferred. Talk-in on 146.97. Contact *Richard Spingarn*, (607) 387-5251.

LONGVIEW, WA The Lower Columbia ARA, W7DG, will sponsor its 8th Annual Ham Radio, Computer and Electronic Equip. Swap Meet 9 a.m.-1 p.m. at the Cowlitz Co. Expo Center in Longview. Admission \$3. Tables \$15. Tailgate spaces \$5. Free parking, overnight RV parking on the fairgrounds for \$12. Electrical hookup available. No VE exams. Vendor setup on Fri., 5 p.m.-9 p.m.; Sat., 6 a.m.-8:45 a.m. Talk-in on 147.26(+), PL 114.8. Take Exit 36 or 39 off Interstate 5 and

follow the signs west for the Expo Center (or fairgrounds). Mt. St. Helens and the Oregon coast are nearby. For more info write to LCARA Swap Meet, P.O. Box 906, Longview WA 98632; or call *Bob KB7ADO* at (360) 425-6076, in the evening. E-mail [kb7ado@aol.com]. Link to flyer online at [www.qsl.net/nc7p/].

WARSAW, IN The Kosciusko Co. Hamfest Computer Show will be sponsored by the Hoosier Lakes Radio Club, Aug. 21st, at Kosciusko Co. Fair Grounds in Warsaw, 8 a.m.-2 p.m. Radio, computers, software, electronic parts, indoor

Continued on page 52



Photo C: At the Arlington, Texas, Ham-Com '99, Gerald KK5YY demonstrated an Arrow dual-band, hand-held Yagi for A-O-27 operation.

duplexer that fits in the handle for use with dual-band HT's. It can be hand-held (a true "Armstrong" rotator) or mounted to a camera tripod. Several that bought this antenna for A-O-27 activity have found that it also does very well with the Japanese Fuji satellites, some portions of A-O-10's orbit, and now S-O-35. The Arrow antenna is not cheap, but you can find out more at the web site: [http://hometown.aol.com/Arrow146/index.html]. Arrow's E-mail address is [Arrow146@aol.com], and the postal address is Arrow Antenna, 1803 S. Greeley Highway #B, Cheyenne WY 82007.

A few satellite chasers have tried using the Cushcraft short dual-band antenna (A270-6S) for satellite work. It's less

expensive and it does function, but could use some serious modifications to be as effective as the Arrow.

The 1999 AMSAT space symposium

It's time again for the AMSAT Space Symposium and General Meeting. Recent and future hamsat developments will be presented in San Diego, California, over the weekend of October 8-11, 1999. The event will be at the Hanelei Hotel in the heart of San Diego's Mission Valley.

If you've never been to the yearly AMSAT event, this one promises to be one not to miss. The Space Symposium will feature two full days of presentations by some of the best-known small satellite designers, builders, and software experts in the world. There are nearly a dozen new hamsat projects in various stages of design and construction. This is where to go to find out what's in store for the year 2000 and beyond.

Saturday evening is set aside for the AMSAT General Meeting, banquet, awards presentations and prize drawings. The prizes at AMSAT events are always good. We expect 1999 to be the best yet for some really serious "door" prizes.

Sunday, October 10th is the beginning of the AMSAT Board

of Directors meeting, but there's a tour of the QUALCOMM Incorporated Globalstar Lab and SpaceDev, Inc. scheduled for the morning. The Board of Directors meeting will begin after the tour, since the Board members will likely be on the tour. Check out the web sites: [http://www.qualcomm.com] and [http://www.spacedev.com] for a preview of the tour sites.

To find out more about the AMSAT Space Symposium and General Meeting, check AMSAT's web site at: [http://www.amsat.org]. The on-line announcement includes numerous links to hotel information, attractions around San Diego, and the ARRL Southwestern Division Convention that's scheduled for



Photo E: Mike W5TWT tried receiving the 70-cm downlink from A-O-27 on his new Yaesu VX5R HT. It worked!

the weekend before AMSAT on the RMS Queen Mary in Long Beach.



Photo D: James KF5WT also worked A-O-27 from the Ham-Com '99 parking lot using his modified Cushcraft dual-band Yagi.

tables and outdoor flea market. Free parking. Overnight camping. Talk-in on 146.985(-). Inside tables, 8-ft., \$10 (includes 1 free ticket). Free outdoor flea market (with ticket purchase). VE exams at 2 p.m., walk-ins expected. For more info, contact **Loren Melton WB9OST**, (219) 858-9374 evenings; E-mail [WB9OST@WAVEONE.NET].

AUG 22

ST. CHARLES, MO "Hamfest 1999" will be held by the St. Charles ARC, 6:30 a.m.-1 p.m. at Blanchette Park in St. Charles MO. Free admission. Ample free parking. Talk-in on 146.67. A parking lot flea market will be held for amateur radio and electronic items only, \$10 per parking space. For vendors inside the air-conditioned Memorial Hall, tables are \$15 each. Call for availability. Contact **Ken Fieser**, (314) 428-4383; E-mail [kfieser@aol.com].

AUG 28

GARDNER, MA The Mohawk ARC, Inc., will hold their 7th Annual Ham Radio, Electronics, Computer Hamfest at the Mohawk Drive-in Theater in Gardner, rain or shine. Spaces will be reserved for those who register in advance. Sellers' hours, 6 a.m.-3 p.m., \$5 per space. Mail advance registration orders to **John Dould AE1B**, 22 South Athol Rd., Athol MA 01331-2722. General admission is 8 a.m.-3 p.m., \$2 per

person. Directions: Rte. 2 to Gardner, take Exit 22, then Rte. 68 South to the first set of lights. Take a right at the lights onto Rte. 2A. Follow the airport signs for 1 1/2 miles. Entrance is on the left. Talk-in on 145.370 rptr.

LA PORTE, IN The La Porte ARC will host a hamfest Aug. 28th, 7 a.m.-2 p.m., at the La Porte County Fairgrounds IN, 2 miles west of La Porte. Admission \$5 in advance, with this ad, or \$6 at the gate. Tables \$10 each. Outdoor tailgating is free. Talk-in on 146.52. Contact **Neil Straub WZ9N**, P.O. Box 30, La Porte IN 46352. Tel. (219) 324-7525. E-mail [nstraub@netnito.net]. See their site on the Web at [www.geocities.com/siliconvalley/byte/1653].

WESTON, WV The West Virginia State Radio Council will hold its 41st annual Hamfest and ARRL Convention, Aug. 28th, at the Jackson's Mill State Conference Center in Weston. Flea market and tailgate spaces available. For more info contact **Patrick Shea N8MIN**, Rt. 4 Box 365F, Weston WV 26452. E-mail [wvsarc@qls.net].

AUG 28-29

WOODLAND PARK, CO The Mountain ARC will hold a Camp/Swapfest Sat., Aug. 28th, and Sun., Aug. 29th, at the Colorado Lions Club Camp, 4 miles north of Woodland Park CO, on Hwy. 67 North. Free admission for buyers.

\$10 daily to camp and/or sell. Set up camp Fri., Aug. 27th, after 2 p.m. Talk-in on 146.820 rptr. Advanced reservations requested. Contact **Wes KOHPZ** at (719) 687-8758; E-mail [wlv@prodigy.net]; or mail reservations to **MARC**, P.O. Box 1012, Woodland Park CO 80866.

SEP 4

ALAMOGORDO, NM The Alamogordo ARC will host a hamfest at the Otero County Fair Grounds on U.S. 54 and Fairgrounds Rd., north end of town, across from the White Sands Mall. Indoor tables, tailgating, dealers, ARRL forum, traffic net forum, VE exams. Free admission. For more info contact **Larry Moore WA5UNO**, 1830 Corte Del Ranchero, Alamogordo NM 88310. Tel. (505) 437-0145, day or night.

SEP 10-11

QUEEN WILHELMINA STATE PARK, AR The Queen Wilhelmina Hamfest will be held at Queen Wilhelmina State Park, 13 miles west of Mena AR, on Hwy. 88. This is part of the Quashita National Forest. Lodge, restaurant, RV and tent camping. Campers, do not feed or bait the bears! Citations may be issued. There has been no danger, but leaving food out could be risky. This year's theme is "50s Revisited." Bring your bobby sox, saddle oxfords, bow ties and other '50s memorabilia. There will be a display of '50s ham gear. VE exams. Flea market, bring your own table. For Flea Market, contact **Charlotte KC5DOR** at [blee@ipa.net]. For other info, contact **Ray W5DLC** at [raysoft@intrastar.net].

SEP 11

BALLSTON SPA, NY Saratoga County R.A.C.E.S. Assn., Inc. will hold its 14th Annual Hamfest on Sat., Sep. 11th, rain or shine, at the Saratoga County Fairgrounds in Ballston Spa NY. Gates open at 7 a.m., with the hamfest running until 3 p.m. Admission is \$5, which includes one tailgate spot and free parking. A fox hunt and VE exams are also featured. Reserved tables \$5 each on a first-come-first-serve basis. Reservations and pre-pay are welcome and encouraged. Early setup for all vendors. For further info and reservations,

contact **Darlene Lake N2XQG**, 314 Loudon Rd., Box #84, Saratoga Springs NY 12866. Tel. (518) 587-2385. Packet [n2xqg@wa2umx]; E-mail [lake@capital.net]. Talk-in on the WA2UMX rptrs., 146.40/147.00 and 147.84/24.

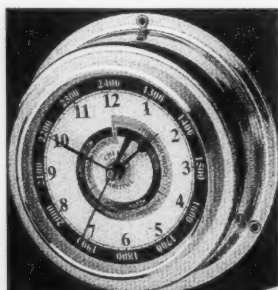
FRANKLIN TWP., PA The Radio Assn. of Erie will present "Erie Hamfest '99 on Sat., Sep. 11th, 8 a.m.-2 p.m., at the Franklin Twp. Firehall. From I-90: 8 miles south of Exit 4. From I-79: Albion Exit 38, Rte. 6N west for 2.5 mi. Talk-in on 146.01/.61. Free parking. Tailgating. Handicapped-accessible. Test bench available. Admission \$4 each. Tables \$8 each. Electric \$2. Tailgating \$1. For vendor registration and advance tickets, send check payable to **Radio Association of Erie, P.O. Box 844, Erie PA 16512**. Please enclose an SASE. Deadline is Aug. 31st. Vendor and tailgating setup Fri., 8 p.m.-midnight; Sat., starting at 5:30 a.m. No outside food or beverage sales permitted. Contact **Dr. Tom McClain N3HPR**, 3954 Solar Dr., Erie PA 16506. Tel. (814) 833-1640; E-mail [tem@erie.net].

SEP 11-12

LOUISVILLE, KY The Greater Louisville Hamfest/ARRL KY State Convention will be held at the Bullitt County Fairgrounds. This is about 25 minutes south of Louisville on I-65. Tickets \$7 in advance (send an SASE), and \$6 at the door. Mail requests for tickets or info to P.O. Box 34444-N, Louisville KY 40232-4444. For commercial spaces info, call (812) 282-7007 or (812) 948-0037. For info regarding flea market spaces and/or tailgating, call (502) 935-7197 or (606) 284-9090. Visit the Web site at [http://www.thepoint.net/~glha/]. Free parking. Limited amount of free overnight camping.

SEP 12

FINDLAY, OH The Findlay Radio Club's 57th Hamfest will be held 8 a.m.-3 p.m. at the Hancock County Fairgrounds, East Sandusky St. (Route 568). Talk-in on 147.5(+) and 444.15. Admission is \$5. Tables \$19 each. For further info, contact **Dave Hoxworth AA8KJ**, 443 Scarlet Oak Dr., Findlay OH 45840. Tel. (419) 423-3402.



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SEP 18

MARGARETVILLE, NY The Margaretville ARC Hamfest will be held at Margaretville Firemen's Fairgrounds at the junction of State Routes 28 and 30, behind the A&P in Margaretville. Setup at 7 a.m. General public admitted at 8 a.m. Admission is \$4 at the gate. Table space is \$10, with tables available for an additional \$5. Talk-in on 146.985. Contact *Hal Murken NQ2Y, P.O. Box 112, Margaretville NY 12455. Tel. (914) 586-3893. Or contact Lester L. Bourke Sr. KB2DCE, (914) 586-3186; E-mail [bourke@catskill.net].*

MT. CLEMENS, MI The L'Anse Creuse ARC will hold their 27th Swap & Shop at the L'Anse Creuse High School, Reimold St., Mt. Clemens MI (2 miles off I-94, Exit 236). Tables for new and old radios, computers and software, and electronic components. VE exams. Free parking. Admission is \$1 in advance, \$5 at the door. 8-ft. tables, \$10 (setup at 6 a.m.). Tailgating \$5. Talk-in on 146.420 and 147.080(+). Contact *Betty McGinn N8SIH, (810) 791-4484, or SASE to P.O. Box 180072, Utica MI 48318-0072. E-mail [Boops@juno.com]. Visit the club Web page at [www.flash.net/~lcarc].*

SEP 19

ADRIAN, MI The Adrian ARC's 27th Annual Hamfest and Computer Show will be held at the Lenawee County Fairgrounds in Adrian. Tickets are \$5. Trunk sales, VE exams. Contact *Brian J. Sarkisian KG8CO, (517) 265-1537 or [kg8co@lni.net]. The AARC Web site is at [http://www.LNI.net/w8tqe].*

HAMILTON TWP., NJ "FallFest '99", sponsored by the Delaware Valley Radio Assn., will be held at Tall Cedars of Lebanon Picnic Grove, Sawmill Rd., Hamilton Twp. NJ. I-95 North to I-295 South: Exit 60A to I-195 East; Exit 2 to Yardville; South Broad St. to end, approx. 3.7 miles; left at Yield onto Old York Rd.; next right onto Sawmill Rd.; site 1.1 miles on right. Open to buyers at 8 a.m. Open to sellers at 6:30 a.m. Admission \$6, non-ham spouses and children admitted free. Free parking. Tailgating space \$10, includes one admission. Covered

table space \$15, includes one table and one admission, some electricity. Advance covered space reservations available. ARRL table. Talk-in on 146.67(-). Contact *FallFest '99, DVRA, P.O. Box 7024, West Trenton NJ 08628. Tel. (609) 882-2240. See the Web page at [www.slac.com/w2zq].*

NEWTOWN, CT The Western CT Hamfest will be held at the Edmond Town Hall, Rte. 6, Exit 19 on I-84. Open 9 a.m.-2 p.m. Setup at 7 a.m. New equipment dealers, flea market, tailgating, computers. Tables \$10; tailgating \$6 (each includes 1 admission). Admission \$4 (under 12 free). Talk-in on 146.67 MHz. Contact *Jeff Cantor WB3DLG, P.O. Box 3441, Danbury CT 06813-3441. Tel. (203) 857-7050.*

SEP 25

DAYTONA BEACH, FL The ERARA and DBARA clubs have again joined together to bring you the 3rd annual Daytona Beach Hamfest and Computer Show, Sat., Sep. 25th, 9 a.m.-5 p.m., at the Embry Riddle Aeronautical Univ. campus on Clyde Morris Blvd., just 1 mile south of International Speedway. Talk-in on 147.150(+600), starting at 7 a.m. Doors open 9 a.m. sharp. Lunch will be provided at modest cost by Embry-Riddle student organizations. Admission is \$5. For advance tickets send a check or money order along with an SASE to ERAU C/O Student Activities, 600 S. Clyde Morris Blvd., Daytona Beach FL 32114, before Sep. 10th. Handicap parking is provided. 6-ft. tables with power are \$7 for one, \$6 for each additional. 5-ft. tables are \$6 for one table, \$5 for each additional. All tables have power connections. Tailgate sites in the paved parking lot are \$3, no power. VE exams for all classes. There will be a hidden transmitter hunt (with a \$50 cash prize) at 4 p.m. You must have a paid admission ticket and sign up for the hunt before 4 p.m. to be eligible for the prize. Contact *DBARA-Hamfest, P.O. Box 9852, Daytona Beach FL 32120; or e-mail [munseyj@mindspring.com]. Web pages are at [http://www.america.com/~dbara/] and [http://www.db.erau.edu/campus/student/club/erara].*

HORSEHEADS, NY The Amateur Radio Assn. of the Southern Tier will present its 24th Annual Elmira International Hamfest-Computer fest on Sat., Sep. 25th, at the Chemung County Fairgrounds in Horseheads. Talk-in will be on 147.360, with an alternate frequency of 146.700 (in case the primary frequency is down). There will be dealer displays of new equipment, and a large flea market area. Breakfast and lunch will be served on the premises. Admission is \$4 for advance tickets, \$5 at the gate. The event will run 6 a.m.-3 p.m., with VE exams starting at 9 a.m. For VE exam info, contact *John at (607) 565-4020. Dealers, please call Gary at (607) 739-0134. For tickets, call Dave at (607) 589-7495.*

SEP 26

YONKERS, NY The Metro 70 CM Network will host a Giant Electronic Flea Market Sep. 26th at Lincoln High School, Kneeland Ave., Yonkers NY, 9 a.m.-3 p.m., rain or shine. Free parking. No tailgating. Indoor flea market only. Donation \$6, kids under 12 free. Vendors, for advance table reservations, the 1st table is \$19, \$15 each additional table. All tables 30 inches x 5 ft., or bring your own tables at \$14 for a 6-ft.-long space. Tables are \$25 each at the door, or \$20 for a 6-ft. space. Full payment is due with registration. Table setups are at 7 a.m. For registration, call *Otto Supliski WB2SLQ, (914) 969-1053. Talk-in on 440.425 MHz PL 156.7; 223.760 MHz PL 67.0; 146.910 MHz; and 443.350 MHz PL 156.7. Mail paid reservations to Metro 70 CM Network, 53 Hayward St., Yonkers NY 10704.*

SPECIAL EVENTS, ETC.

AUG 20-22

YORK COUNTY, PA On the days of Aug. 20, 21, and 22, the York County ARC and its members will maintain an active presence on the amateur radio frequencies of 7.250, 14.250, 21.250, and 28.500 MHz, to allow as many amateur radio contacts throughout the world as possible. To apply for a Special Event Award, please send a photocopy of your logs or QSLs with 3 IRC (or \$3 US) to the award manager: *KC3TL, Pete*

deVolpi, 408 Hillside Ave., New Cumberland PA 17070-3036 USA. The award certificate bears the official seal of the York County 250th Anniversary, and is signed by the four commissioners of York County. A printing of only 2500 of these limited edition awards will prove to make this certificate a very valuable award for collectors.

AUG 21-23

SONOMA, CA The Amateur Radio Clubs of Sonoma County CA, co-ordinated by the Empire ARS, K6EAR, will operate a Special Event station 2400 UTC-0000 UTC at the Pacific Coast Air Museum's annual Open House and Air Show at the Sonoma County Airport. Participating clubs are the Sonoma County Radio Amateurs, the Redwood Empire DX Assn., the Valley of the Moon ARC, and EARS. Operating frequencies will be 7.044, 7.244, 14.044, 14.244, 21.044 and 21.344. For QSL, send QSL and a #10 SASE to EARS, P.O. Box 4151, Santa Rosa CA 95402 USA.

AUG 28-SEP 2

HAGERSTOWN, MD The Antietam Radio Assn. will operate W3CWC 1600Z-0200Z Aug. 28th-Sep. 2nd to commemorate the 130th anniversary of the birthday of Hiram Percy Maxim, an ARRL co-founder and noted inventor. Operation will be on or near 3.905, 7.23, 7.035, 14.250, 28.450, and 147.09 MHz. A colorful certificate will be available after the QSO for a QSL and large SASE. Mail to the Antietam Radio Assn., P.O. Box 52, Hagerstown MD 21741-0052 USA. Please mail requests for the certificate by Sep. 30, 1999. Thank you.

SEP 11-12

MARIETTA, OH W8HH, the Marietta Amateur Radio Club station, will be celebrating the annual Ohio River Sternwheel Festival with a Special Event station on Sat. and Sun., Sep. 11th and 12th. Hours of operation are as follows: Sat.—1300-2300 UTC; Sun.—1300-1900 UTC. CW will be .055 kHz up on 160, 75/80, 40, 20, 15, and 10 meters. On SSB, on General subbands up. A certificate will be issued for confirmed

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continued from page 6

the first type of ham or even the third type—or he may just get out of amateur radio in disgust. (Then we all lose.) This type of ham just needs a helping hand, someone who's willing to help him set up a station or even upgrade! They tend to find only the disgruntled hams, and end up leaving the hobby. Funny how most of us never seem to notice this type of ham as they slowly fade away ...

3. The Very Rare Ham.

This is the ham who wants to help out, and does, in every way that he or she can. This can be in the form of joining the ARES, becoming a VE, starting a ham radio class, setting up a club station, helping out in the community, or helping that second type of ham. Keep in mind that this type is very rare and if you find one, don't lose touch. Too bad that this type of ham seems to be a dying breed. They might not be, if a few more "type two" hams were helped out by, say, the "type one" hams. Type three hams care about amateur radio and its future.

Which type are you? Food for thought!!

Reprinted from the *The "Modulator"* (Ft. Myers FL), October 1998; excerpts by Clinton Herbert AB7RG.

Electrifying Health News

Six years of research have produced little hard evidence that the magnetic fields around electric power lines cause cancer, yet some lingering concerns remain. This is the gist of a National Institutes of Health report released on Tuesday, June 15th.

The report says that there have been some small statistical associations between magnetic fields and childhood leukemia as well as chronic lymphocytic leukemia in adults exposed to the fields through their work. But, says the report, there is little confirmable documentation to make any valid connection between the two.

The report indicates that research is continuing in the area of these lingering concerns. Also that until we know a lot more, efforts to reduce human exposure to all electromagnetic fields should continue. [Italics added.]

Meanwhile, the Consumer Product Safety Council says that thirty-two percent fewer people accidentally were electrocuted in 1995 than in

1985. The actual number of electrocutions declined from 340 in 1985 to 230 in 1995. Ten percent of the electrocutions in 1995 were attributed to mistakes in installing or servicing rooftop antennas.

Thanks to the NIH and CPSC, via Newsline, Bill Pasternak WA6ITF, editor.

Brazilian Year 2000 Moonbounce Conference

The Araucaria DX Group is working on early preparations to stage an international amateur radio event to be held next year in Brazil!

This event will be identified as the "EME 2000 Brazil Conference." It is bi-annual and was last staged in Paris in 1998 (prior to that, in Washington DC in 1996).

The forthcoming conference will be the ninth, and will be dedicated to 432 MHz and upward Earth Moon Earth (EME) amateur radio activities, covering all technical aspects of this facet of the hobby.

We have received offers to present 26 technical papers at this conference. Rio de Janeiro has been selected as the conference location, and the event will take place on August 18th and 19th, 2000.

A Web page covering this event is available on the Internet at [www.eme2000.com.br]. Please send E-mail to [eme@inepar.com.br].

From an announcement sent by D.W. Murden PY5ZBU.

The Evolution of Amateur Radio Clubs

Radio clubs have existed for over 75 years, but it was not until the conclusion of World War II that ham radio clubs, associations, and societies peaked in popularity. Most pre-war clubs were experimenter groups interested in the new, emerging technology of electronics and communication science. Locally, the Jacksonville Radio Club was active in the 1930s. Though hams belonged, amateur radio was not the only focus.

After the FCC lifted the wartime ban on amateur radio operation in 1945, an evolution from a mostly technical, science-oriented club model to a multipurpose group accelerated. The focus narrowed, with amateur radio becoming the main


2-way contact. Send QSL and 9" x 12" SASE to W8HH, P.O. Box 393, Marietta OH 45750 USA.

PLATTSBURGH, NY The Champlain Valley ARC will operate their Station W2UXC, 1400Z-1900Z, Sep. 11th-12th on 7.265 or 14.265 MHz, to commemorate the Battle of Plattsburgh, the final invasion

before the end of the War of 1812. For a certificate, send an SASE to CVARC, P.O. Box 313, Morrisonville NY 12962 USA.

SEP 25-26

HAMPTON, VA The VASC Amateur Radio Group, Inc., will operate KE4ZXW Sat., Sep. 25th and Sun., Sep. 26th, 0-2400Z on

UO-22 or KO-25; 1500-2200Z at :00 on 7.265; at :15 on 14.265 and at :30 on 28.365. The occasion is to celebrate 4 full years of 9600-baud automatic satellite station operation, and amateur radio exhibit. To apply for an Anniversary QSL, SASE to Ed Brummer W4RTZ, 108 Oyster Cove Rd., Yorktown VA 23692 

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NEVER SAY DIE

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that's progress, eh? The problem is that some software companies don't know they have problems, and others aren't telling. You may have some nasty surprises on January 1, when your computer freezes as solid as the ice outside.

The Sky Is Falling!

It's difficult not to get swept up in the Y2K hysteria. Well, here's an example from my E-mail. Chew on this ...

"There's a good article in the January *Scientific American* on Y2K, with this title and subtitle: 'Fixing Y2K seems simple: change all two-digit years to

four digits. But that tedious and unexpectedly difficult process will take more time than is left.' The article concludes: 'I believe that severe disruptions will occur and they will last perhaps a month. Additional problems, ranging from annoyances to more serious issues, will continue to crop up throughout 2000.'"

Just a month without a major resource like water or electricity in the middle of winter could drastically thin out populations. *Scientific American* hasn't done anywhere near as much research on this issue as I have. They are incorrect. The disruptions are going to last much, much, much longer than just a month. That sort of optimism isn't backed by any objective facts. When the grid collapses, we aren't going to see it

come back up. I agree with Gary North's bleak assessment.

The Canadian government is telling the truth to their citizens, while ours is predictably lying to us about what is coming. They know damn well what is coming: (Clinton has recently signed executive orders 10997-11095, 12919, 12938 solely for the purpose of putting us under martial law. They can be viewed at: [<http://www.disastercenter.com/law/>].

View them, then check this out: A newspaper article titled "Marines Seize Downtown" appeared in the July 24, 1998, Jacksonville Florida *Metro*. 100 U.S. Marines took part in a training exercise called "Urban Warrior" to practice seizing control of key parts of the city. A

criterion for club affiliation. Recruitment of newcomers, training classes for the new Novice class license, public relations, more operating events, emergency communications assistance, and exchange of technical information became major objectives of many clubs.

Until the late 1960s, hams in an area were usually unified under a single club banner. The ham population then was about a third of what it is today. A large club had 75 members.

Around 1970, VHF FM and repeaters soared in popularity. Commercial technology of the '60s became available cheaply to hams as surplus. Early repeaters usually required combined efforts of hams in an area to finance, install, and maintain. Traditional, general interest groups became fragmented and were often indifferent to interests of those who were amazed by repeaters, autopatches, and the novelty of reliable local mobile-to-mobile communications capability. A ham with an HT in public in 1973 brought looks of amazement from non-hams who gasped as an autopatch was conducted. Today, such capability is routine, but in the '70s, it was a big breakthrough.

Special interest clubs with a narrow focus characterized the 1970s. VHF FM/repeater groups were the most popular, followed by DX/contest groups, and later came digital clubs. General interest clubs continued to decline in the 1980s, although not drastically.

Historically, hams have not been attracted to clubs in major percentages. In a midsize city of 1,000 hams, typically about 350 to 400 will be active at any one time. Many operators run "hot and cold" over the years, drifting between active participation and inactivity. Hams are not known as joiners.

About 250 of the 1,000 hams will belong to the ARRL. 180 or so will join a local club, and about 60 of those will regularly attend club functions and meetings. And a core group of about 50 (5% of the total) will serve as officers or project chairpersons. It is this core group which is key to the future of amateur radio clubs.

Increasingly, members of the 1990s tend to have a "been there, done that" outlook when it comes to volunteering for club duties. Many will perform a function one or two times and then move on. Ham radio and clubs rate a low priority. Many members come to view themselves more as "subscribers" than as members. They expect to receive club services such as repeater access and autopatch use but are not motivated to exert much effort aside from paying annual dues. A repeater group officer once remarked that the best way to ensure a big meeting turnout was to have the repeater "crash" a few days before the meeting and stay off the air. Members who have not been to a function in years will turn out, demanding to know the cause of the interruption of their "service" and upon whom to fix the blame. While somewhat overstated, there is some truth to this.

Most clubs (amateur radio and otherwise) are possible due to efforts of that 5% core. These operators repeatedly take part in club activities and lead projects. Some remain active for decades. The future of clubs rests on keeping this core at critical mass. Without a sufficient core, a club will not function. An interesting facet is that although our club's membership has varied from 60 to almost 500 over the years, the size and quality of the core has been largely independent of the membership size during any year. A club of 60 members might have 15 core members while a club of 500 might have 20 or 30!


Large clubs are preferable because, when regulatory problems arise, officials tend to listen to large groups of people rather than individuals. Postage breaks for mailing newsletters are available whenever 200 or more are sent at the same time.

Clubs that survive will be those who identify those activities which can attract the interest of core members, who then promote the activity to the membership. Members vote for or against an activity by their participation or non-participation. Clubs usually have limited resources in funds and volunteers, and these should be focused on a limited number of well-chosen activities.

Activities should be oriented toward the entry-level ham, although more advanced alternatives can be included if volunteer resources permit. Meetings should not be too technical—an EE degree shouldn't be necessary to understand the speakers.

A trend is toward fewer in-person meetings. Some special interest clubs have cut back to quarterly meetings. Some general interest clubs meet every other month.

Club newsletters may become endangered. Nationally, many clubs have dropped them. The newsletter of the future may be delivered electronically. Club functions and activities change as years pass.

By Billy Williams N4UF, seen in the February 1997 issue of the *Balanced Modulator*, published by the North Florida Amateur Radio Society. 

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similar exercise took place last May in Chicago with 80 U.S. Marines. As part of the Navy, the Marines aren't constrained by the *posse comitatus* restrictions that prohibit the army from domestic law enforcement. (Of course when martial law is declared, *posse comitatus* will be suspended by executive orders.)

Canadian Government Is Telling the Truth

The Canadian government has been far more up front about the fact that martial law is coming. In an editorial in the Canadian newspaper *The National Post* on December 28, 1998, it states that the RCMP (Royal Canadian Mounted Police) are recommending that prudent Canadians keep at least two weeks worth of food and cash and a month's worth of water stored for January of 2000. The Canadian armed forces have been preparing for the largest mobilization since the Second World War. Operation Abacus will deploy up to 32,000 troops to quell insurrections and rescue the unfortunate when the next millennium begins. The Canadian federal Year 2000 contingency planning group is recommending the sweeping powers of the Emergencies Act (the replacement of the old War Measures Act) be at the ready if and when chaos strikes. The U.S. government will never be this honest, and the Canadian government is not being forthright enough.

People worldwide are going to need far more than just the 2 weeks' worth of food and the one month's supply of water that the Canadian government is recommending.

With a daily feeding on that kind of stuff, it's easy to start contemplating on what a house of cards our civilization really is. When the whole western U.S. managed to recently lose power for several hours because one small power station went down, are the suggestions by some experts that come January One the grid could go down and stay down all that ridiculous? If it

does, what might happen as a result? Almost everything we have depends on power. No power, no planes or trains. No trains, no gasoline. No power, no businesses or stores open. No gasoline, no trucks delivering food. No roads plowed. No water supply. No telephones. No radio or TV. No banks. No toilets. No stock market. No newspapers. The results of all that are so awful that we don't even want to think about it. Forget it. That's just the rantings of some hysterics. It'll never happen. It *can't* happen! Y2K is just going to be a minor annoyance, right?

Hmm, let's see now, how much would a solar power system cost that would at least run my ham station if the power went down? My emergency diesel generator would eventually run out of fuel, so I'd want solar or wind power to keep my ham rig going.

Hey, I've got to stop that kind of thinking. That's just crazy.

Hmm, maybe I should put up a new tower so I'll have a better signal. You know, just in case.

Nah. Stop worrying, be happy. Everything is going to be just fine.

Sanguinity

I'll tell you why I'm semi-obsessed with the Y2K mess. Yes, I saw the issue of *Time* with the cover feature ridiculing the Y2K worrywarts. But I've also noticed that the people who seem to have the best grasp of the situation are far less sanguine. An item in *Newsweek* the same week said that the Social Security computers will keep the checks going to the aged, but that there are some serious problems with the Medicare and Medicaid systems.

When the MITS Altair 8800, the first microcomputer, was announced in January 1975, I did two things. I recognized the potential impact of this development, so I got one and sat down to learn exactly how it worked. It was this adventure that sparked the idea for *Byte* magazine. The first

year's issues were done by me and the 73 staff.

It's my understanding of how computers work that worries me the most about Y2K. They are no mystery to me. If you've used one much you know how easily even a slight bug or virus can blow your data to smithereens. And Y2K is one hell of a bug!

I look at how dependent our whole civilization has become on computers. They're running our airlines, trains, power companies, telephone systems, banking, satellites, communications systems, every aspect of the media, our VCRs, microwaves, our washing machines, and so on. If you stop and think about it, we have one heck of a house of cards, with all of these systems interrelated, so if one goes down, blooey, they all collapse.

If the railroad computers stop the railroads, the coal stops going to power stations and the power grid shuts down. We've seen how delicately that system is set up, with whole parts of the country losing power when one small system breaks down. No power: no railroads, no banks, no TV stations, no newspapers, no grocery stores, no gas pumps, no telephones, and so on. If any part of the whole system fails, that'll crash everything else. Then the question is, how long may it take to get everything going again? And where do they start—without communications.

I hope that Y2K will be the "bump in the road" the Pollyannas are predicting. I also hope that it isn't going to be the catastrophe that the people who have done the most serious investigating are predicting.

Having run some software companies, it's been my experience that as a general rule it takes about seven times as long as programmers predict to get their software working right. In this case, they have to go over hundreds of millions of lines of code, often in some prehistoric language, and correct the date-sensitive problems. Then they have to test drive the repaired code,

looking for errors they missed, and correcting new errors they've introduced. This is not trivial, to use the programmer's term.

So here we have tens of thousands of interrelated systems, any one of which could trigger the domino effect. Maybe millions. I hope the speed bump in the road doesn't turn out to be Mt. Everest.

Bamboozled

The government is now taking over half of your pay for its programs. And, when you look closely at most of them, your money is being wasted. You could more than double your pay if you'd stop the bandits you've elected and then reelected from going hog wild with your money.

The federal government now takes 23% of the gross domestic product, up from 18% in 1960 and only 4% in 1930! The huge government we've let build up would be totally unrecognizable to our founding fathers, who gave Congress very limited spending authority. And most of it's spending on social projects. Entitlements. These are programs where Paul is entitled to Peter's money. Robbing Peter to pay Paul.

Social Security has ballooned from \$25 billion to \$336 billion, with no ceiling in sight. Health care has gone from \$2 billion to \$272 billion. Welfare from \$30 billion to \$225 billion, and the poverty rates are no lower now than before the War on Poverty started. Yet national defense spending has only about doubled in the last 50 years!

We have met the enemy and the enemy is us. We are the ones who elect these spenders, and then we keep reelecting them until they head a spending committee. And we still reelect them, no matter how much it is costing us out of our pockets.

As in so many things that we have been led to believe in, we've been bamboozled. Hoodwinked. Scammed. De-frauded. Screwed.

As I mentioned when I reviewed *A Nation of Millionaires*,

if our Social Security withholdings were invested as they are doing in Chile and a growing number of other countries, and if we could have health care savings accounts, then we'd all be able to retire as multi-millionaires.

Wasting Money

One of the larger hamfests that has stopped inviting me to speak sent me a form letter suggesting that I donate prizes and advertise in their program. Hey, sorry, guys.

I may be a difficult learner, but if you hit me on the head long enough it finally gets my attention. For many years I was happy to send a bunch of prize subscriptions to hamfests. But after having enough hams come by my booth and not subscribe because they were hoping to win one of the prize subs, I finally stopped shooting myself in the foot. How many ham rigs would providing one as a prize stop being sold at a hamfest? Then there's the idea that, gee, someone is going to get the equipment for free, so why should I shell out \$600 for something that could be free? A prize tends to cheapen the product in a prospective customer's eyes.

Well, how about program booklet ads? For years I ran every kind of ad I could think of in hamfest program books. I don't think I ever got one single subscription as a result. Not one! Oh, the hams grab a program when they get to the hamfest, and a few of them actually look to see what talks are going to be where and when. There's no evidence that a program book has ever been looked at after that. It goes up on a shelf in the shack and lies there untouched until the ham dies and his wife can finally throw it and all those ham magazines out. There is no record of a ham ever throwing *anything* ham-related out. Unless the ham specifies in his will that his QSL collection is to be buried with him, as is usually the case, the XYL will throw that clutter out, too.

Ham industry people, unless you are solidly convinced that

any prize you donate is going to somehow result in your selling ten times the cost of your equipment in added sales, don't be a sucker.

Leaders and Followers

When I see teenagers smoking, I know two things. One, they're stupid. Two, they're more worried about what others think of them than what they think of themselves. I know they are followers (a.k.a. sheep).

When I see teenagers wearing baseball caps on backwards I know they are followers.

When I see them wearing sloppy, baggy clothes I know they are unable to think for themselves and will never be leaders or entrepreneurs.

When I see kids with their sneaker laces trailing I know they are followers.

When I see teenagers drinking beer, I know they are followers and incapable of original thoughts.

When I was in college a group of my fraternity brothers would bring in a keg of beer on weekends and get stinking. I've watched the alumni reports and none of 'em have ever achieved anything of significance. While they were boozing it up in the living room, I was in my ham shack making contacts with hams around the world and building ham and hi-fi equipment.

Many of 'em smoked. I think they're almost all dead now.

Oh, I tried smoking and beer, but my body warned me against that crap and, not being driven by peer pressure, I paid attention. Ditto coffee, too, oddly enough.

No Takers

A note from Keith KA8LDS mentioned that at the December election of officers meeting of the Dixie Amateur Radio Club (Utah), no one would take the job of president. A new ham, who had just moved into the area, turned up at the January meeting and was quickly elected.

Well, being the president of any club is a responsibility, and most people seem to

spend their lives avoiding responsibility. These people are what are known as "followers." Either through heredity or extended exposure to our public school system, they are unable to think for themselves, so they do what they're told and avoid confrontation. It would never occur to them to start their own business or to accept the responsibility of being the president of a club.

Yes, being the president of a club is work, but it's fun, too. You're in show business. Meetings are either fun for the members or they'll stop coming. Just getting hams together for a meeting doesn't cut it. You need a program. Preferably a controversial program.

For instance, if you've a ham store in your area, get the owner to come in and tell some stories about the really crazy customers he's had to deal with. Chuck Martin WA1KPS, who used to run Tufts Radio, used to tell me about some of his experiences and I wish I'd taped them! Unbelievable. Anyone who tries to tell you that even some hams are sane needs a wedge.

Does anyone in your area have a new rig he can bring for a show and tell? How about some really odd person who has let his reason depart him and is making some kind of equipment to sell to hams? I know I'd drive a long way to hear someone who's been flying the new Kachina system.

Or how about getting your director to come in and explain why the League has done virtually nothing to get newcomers interested in amateur radio? And why they are still pushing so hard to keep newcomers out with their code requirements? And to discourage Techs from upgrading?

Is anyone in your area making satellite contacts? Slow scan? Heck, is anyone doing anything but talking about nothing on the air?

Scott Joplin

The more I'm reading about Martin Luther King, the more I'm disturbed that he's been

selected as a representative of the black race for a day in his honor. There are many blacks who have contributed more to our country, and who don't have as much bad baggage.

My first choice would be Scott Joplin, who, as far as I'm concerned, was the greatest American composer of *any* race or any time. My second choice for the greatest American musical genius would be Louis Moreau Gottschalk, followed by George Gershwin, Cole Porter, Lenny Bernstein, et al. We've had a few giants, but Joplin's genius completely outshines them.

Joplin has left us with a fantastic legacy of indescribably beautiful music. If all you're familiar with are "The Entertainer" and "Maple Leaf Rag," you have one heck of an experience in store.

I first became acquainted with Joplin when I saw *The Sting*. I said, wow, how have I managed to miss such great music? I bought every LP I could find and played them night and day. But the more I played them, the more I sensed that the performers were missing Joplin's real spirit.

Through the usual serendipity, chance had me find Scott Kirby, who was playing Joplin the way I was hearing his music in my head. I built a studio and we recorded almost everything of Joplin's. If you'd like to hear a sample, send \$10 for a cassette (Volume 3) with 12 of Joplin's rags and songs, including the Maple Leaf Rag, and Solace, the Mexican serenade. \$15 for the CD. You'll see what I mean and be addicted. The next thing you know, you'll be looking for ragtime festivals with Scott Kirby performing.

I'd prefer to see a holiday celebrating a black performer who started playing the piano in a whorehouse in Sedalia, Missouri, and ended up having an opera performed on Broadway. His genius has thrilled music lovers for a hundred years and, if we don't get wiped out, will thrill people for at least another hundred.

Music Biz

When compact discs were

first introduced in 1983, the music and audio magazines ridiculed them unmercifully. We would always have LPs, they agreed. Besides, they said LPs sounded better than CDs.

I felt that CDs sounded better—no needle scratch, no turntable rumble, no bass and treble limitations, nowhere near the limitations on dynamic range, and so on. But I knew that the public would need a guide to tell them which were the good CDs and which were the bummers, rating audio quality, performance, and the quality of the music itself. So I started *CD Review* magazine in 1984. When CDs became the fastest growing new consumer electronic industry in history, my magazine became the country's leading music magazine.

After seven exciting years I felt that the era of high growth would be ending. By then everyone had replaced their LPs with CDs, plus there had been nothing new in music in years with which to spark sales. Not one classical music piece had been written in almost 40 years worth listening to twice. Popular music had disintegrated into garbage. Not even country music had survived the blahs. So I sold my magazine to megapublisher IDG. It has since disappeared, but not before deserving to disappear.

One of the things that might have helped the music industry survive was a lowering of CD prices. In the early days it cost around \$3.50 per CD to make them, so a \$15 retail price made sense. But with automation and competition, the cost of making a CD got down to around 65¢. No wonder so many companies are able to give them away! But the record companies kept their prices high, killing the public's demand for new music, and helping to put the record store chains out of business one after the other.

Now comes MP3 and cries from the record companies that the Internet is going to put them out of business. Since this gang of six megacorporations (five are foreign-

owned) are, in my opinion, thoroughly corrupt, it couldn't be a better comeuppance. One of the best things that could happen to music would be for the major labels to go out of business. They are the problem, not the solution.

Before the CD we had both LPs and 45s, with the 45s for single songs. CDs, with their one hour recording time and cost, killed the issuance of single songs. It's all "albums" now, and it's seldom that there are two singles on an album that get played more than once.

Along comes MP3, a compression system which provides CD-quality sound for a three-minute song on 3 MB of disk space.

As an aside, in case you wonder why songs generally run three minutes, it's a hang-over from the old 78 rpm record days, when a 10" record held 3.5 minutes of music on each side. The 12" discs held 5 minutes per side.

It's easy to download the MP3 software, and then all you have to do is find any of the endless sites making the music available. How popular is all this? A recent study showed that high school students have virtually stopped buying CDs. The record industry is all upset, but there isn't much they can do about it. Gee, isn't that tough!

The public will best be served if there is a way for what few creative people we have in music to get their creations to the public.

As I've mentioned before, a report in *Forbes* showed that 98% of the performers on the major labels never made a nickel of royalties. The record companies use the same creative bookkeeping as the movie giants. When I recorded the Marty Balin group (Jefferson Airplane, Jefferson Starship) in my digital recording studio and put them out on my *Green With Envy* label, they made far more royalties with me than they ever did with the major labels. I've still got a few of their CDs and cassettes, so if you'd like one send me an extra \$5 the next time you order some of my books.

If MP3 topples the major labels, there are thousands of small labels waiting for their turn to get your business. I found that it was these independents (the "indies") which had the *only* creative new music. To help them reach the public despite the major labels spending over \$100 million a year to prevent radio stations playing indie music, I produced and distributed millions of indie music samplers, helping to boost their sales from 4% of the market to almost 16%! Alas, when I sold my magazine, that was the end of the indie samplers. The new owner didn't want to upset the major labels.

I wish I had the time to set up an MP3 site where I could make the tens of thousands of indie songs I've got stored here available. Some of them are really exciting.

Serendipity

Sherry has been after me to let you know about the *Better Generation* CD and cassette I made for Marty Balin—recorded in my studio. Remember the Jefferson Airplane and Jefferson Starship? Well, that was Marty Balin and his group. Marty needed a CD of his new songs to sell on his group's next tour and he'd been so badly screwed by the major labels that he came to me. Marty claims he's made more royalties from this release than from anything his group had done in the past.

Anyway, just as I was getting Marty's CD and cassette ready to promote, a letter came in from Ian Zukswert of Broadalbin, NY. "I'm writing to let you know how much I enjoyed the CD *Better Generation* by Marty Balin. I happened on it at a record store in Albany. It's great to hear some super music by the extremely talented Marty Balin once again. He's a legend with one heck of a career and I appreciate your making it possible to hear some of his current tunes."

If you're into the "Jefferson" sound you'll enjoy Marty's latest release. If you're interested I'll make the CD or the

cassette of *Better Generation* available for you for \$5. While they last. Add it to your Radio Bookshop order.

Trust

After having enjoyed the seemingly endless exposés of government corruption on CBS' *60 Minutes*, I was disappointed in the recent *60 Minutes* 2 spinoff. Mostly potatoes and little meat. But then *20/20*, ABC's imitation of *60 Minutes*, started off with a fairly meaty program of exposés interlaced with sob-sister filler and gradually lost its way. NBC's *Dateline* never did get the hang of digging for dirt. *48 Hours* too started off exposing corruption, but gradually eroded into human interest pieces—a.k.a. sob-sister fluff.

How much of this downslope of these so-called magazine format shows is the result of low budgets, and how much a reflection of the harsh realities that the exposés show? While they are interesting to watch, seldom do they result in any changes being made, plus they stir up the anger of major corporations and their government connections, which are the root of much of the corruption.

Has the concept gotten through to you yet that the bigger our government is, the more corrupt it is? Money is the key. As they say, just follow the money. Well, it's not that difficult to follow it from major corporations through their lobbyists into the pockets of politicians, who need the money to get reelected—and other incidentals—you know, like mistresses and nice homes. Has the parade of upper echelon Clinton Administration people being dismissed in disgrace gotten your attention?

Sure, some legislators get elected and go to Washington with the intention of doing good. And they do very well indeed. It doesn't take long before the message gets through—you either go along with the system or you will get nowhere.

You're probably aware of

all this, but feel helpless to do anything. My approach is to spread little cancers into the system and hope they'll grow. Cancers? Yep, with my Never Reelect Anyone battle cry. Look, if enough people will sign up to NRA, lobbyist money will dry up because reelection campaigns won't work any more. You want to run for Congress? No problem, but it's one term and you're out. No cushy committee assignments. The whole pork system would blow away and Congress would be able to actually work for the betterment of the country instead of themselves. Yes, it's a novel concept, and probably will never fly.

Sale!

A while back I put together a 64-page book of my as-of-then-unpublished editorials. Well, I tend to get several months ahead, so I thought they could be helpful to ham club newsletter editors to reprint, providing them with some interesting filler material. The book has 60 of my editorials, covering the usual wide variety of subjects. It sold for \$5 and sold well. But since then the editorials have appeared in 73, so I can't advertise them as editorial previews. I have a few copies left, if you're interested. \$2 while they last. If I run out I'll give you a \$3 credit toward your next purchase.

If you've an interest in cold fusion, I've got one whale of a bargain for you. How about the most recent seven issues of *Elemental Energy* (Cold Fusion), a \$70 value, for \$25? I want to get more people interested in experimenting and, hopefully, in investing in the field. These issues are packed with reprints of cold fusion patents, and a series of theory papers by the world's leading scientist in the field, Professor Hideo Kozima. The whole set runs 484 pages, so it'll keep you busy for quite a while. This includes a reprint of the NASA lab report confirming the cold fusion excess heat reality. For \$5 extra, I'll throw in a copy of the

premiere issue of *Cold Fusion*, the one that won the *Folio* prize as the best new technical publication. It's also packed with good information. Order the \$25 CF-1 package for the seven most recent issues (#22-28), or the \$30 CF-2 package for the #1 and #22-28 collection. While they last, naturally, and the supply really is limited.

Taxes

Here's an interesting project for someone to research. Maybe a college student. I'd like to know (and so would a lot of other people) what percentage of our paychecks go for taxes. That would include state and federal income taxes, mandated employer insurance such as medical and unemployment, Medicare, sales taxes on the remaining money we typically spend, plus gas, telephone, cigarette, movie, and other taxes. A percentage of the cost of everything we buy is taxes, including excise taxes on imports, state transfer taxes, property taxes, inheritance taxes, playing card taxes, car registration, mandatory car insurance, and so on. Then there are the taxes on the salaries of the people who make the products you buy. There are gas, road, and license taxes on the trucks moving our food.

If we take someone, for example, who is making \$2,000 a month before any taxes, what percentage of their \$24,000 gross would be net after all taxes? I suspect that the recent 50% estimate may be low. Say, do you mind working half of your time just to support the government? Early in our century it used to take about 2% of people's wages to run the government.

The Fed

Though you probably already know that the Federal Reserve Bank isn't government owned, but is a group of private banks, I'll bet a bunch that you don't know how these banks got their franchise to issue all of the money for the country.

It all happened between 1:30 and 4:30 a.m. on December 22, 1913, when the Democratic members of the Conference Committee, without letting the Republicans know about the meeting, rushed the Federal Reserve Act through the House and Senate. The next day, President Wilson signed the act into law.

The act transferred the money supply of the United States from Congress to a private banking elite, giving them a monopoly. The Federal Reserve is controlled via 53% of the stock by the Federal Reserve Bank of New York and the Chase Manhattan Bank.

The chairman of the House Banking and Currency Committee, Louis McFadden, said, "We have in this country one of the most corrupt institutions the world has ever known. I refer to the Federal Reserve Board."

Well, gee, if the Fed is so terrible, how come we haven't been seeing media exposés in the papers and on TV?

Guess who the majority stockholders of the TV networks and major newspapers and magazines are. The banks, of course. The same banks that control the Fed. Less than 25% of our daily papers are independently owned.

Well, if you were controlling a major bank with an exclusive government license to make money, you'd cover your ass by using some of that clout to make sure no one would upset the apple cart.

John Swinton, the former chief of staff of the *New York Times*, made this statement at the New York Press Club: "There is no such thing as an independent press in America, if we except that of little country towns. You know this and I know it. Not a man among you dares to utter his honest opinion. Were you to utter it, you know beforehand that it would never appear in print. Were I to permit that a single edition of my newspaper contained an honest opinion, my occupation, like Othello's, would be gone in less than 24 hours. It is the

duty of a New York journalist to lie, to distort, to revile, to toady at the feet of Mammon, and to sell his country and his race for his daily bread. We are the tools and the vassals of the rich behind the scenes. We are marionettes. These men pull the strings and we dance. Our time, our talents, our lives, our capacities are all the property of these men. We are intellectual prostitutes."

It's interesting to read about how banks got started as money changers (maybe you remember Jesus getting himself in big trouble messing with these guys). Check out [www.themoneymasters.com].

With a potential cash panic coming up as more and more people get wind of the possibility of a serious cash shortage as a result of Y2K problems, you have to remember that 97% of the money you have in the bank has been loaned out, so once their 3% cash reserve is gone, they have to close their doors.

Actually, banks are permitted to lend out ten times more money than they actually have, and charge interest on it. Maybe you've wondered why bank buildings are always the biggest and fanciest in town.

If I die of a "heart attack" or something, you'll know that I've finally managed to step on toes that are too big.

Congress did this, and Congress *could* undo it, but with the money controlled by the few people who control the big banks and the media, and Congress being controlled by money, there isn't a chance.

Other than this old crackpot in New Hampshire, who else has the stupidity to blow the whistle on how crooked our money, banks, schools, government, and health systems are?

A Fungus Among Us

Dan Carlson, the chap who developed Sonic Bloom, which makes plants (including trees) grow over five times faster and bigger than

Continued on page 62

PROPAGATION

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August

There will be a full solar eclipse on August 11th in the northeastern USA, northern Canada, the North Atlantic Ocean, Europe (including the British Isles), North Africa, Asia (except the eastern part), and the northern Indian Ocean. The eclipse will be partial elsewhere. Totality will occur at approximately local noon.

As usual, the HF bands in August will be recovering from dull summertime conditions, but are not expected to become fully active until September. Sunspot cycle 23 continues to be disappointingly sluggish, with only occasional spurts of the Solar Flux Index to the neighborhood of 200. To take advantage of these times, listen to WWV on 10 MHz at 18 minutes after any hour for the report of "Solar-Terrestrial Conditions."

You can see from the August calendar that there are likely to be a few Good (G) days this month: the 10th, and the 25th-27th. The Poorest days (P, VP) are likely to be on the 4th, 5th, and 19th-21st, which are expected to exhibit some solar flare activity and a very active magnetic field with accompanying ionospheric disturbances. There is a distinct possibility of other geophysical upsets such as earthquakes, hurricanes, and tornadoes at these times. However, conditions following recovery from the poorest days are likely to be very good.

September

This month is expected to provide some excellent DX opportunities on the HF bands, although Cycle 23 continues its

sluggish and slothful ways and the solar flux index remains below 200 at the time of this report (June).

Your *best* days are expected to be 4-7, 12, 13, and 16-18. The *poorest* days are expected to concentrate at the end of the month between the 25th and the 30th, when you can expect a very disturbed magnetic field, poor signals (if any) on DX paths, high RF absorption and strong geophysical upsets on earth, including the possibility of a major hurricane during the last week. (See calendar.) *Semper paratus*.

Band-by-band forecast

10-12 meters

Expect morning F2 path openings to Europe and Africa; on (G) days, midday path openings to South and Central America, and F2 path openings to Japan, Australasia, and the Pacific during the afternoon at your location. DX moves west as the day progresses.

15-17 meters

Expect good DX paths to most areas of the world, with excellent openings from the northern hemisphere to Africa, South America, and the Pacific during hours of daylight, and peaking during local afternoon. Good short-skip communication over 1000 miles will occur on (G) days.

20 meters

Very good DX openings to all areas of the world from sunrise through the early darkness hours. The signals will peak an hour or two after sunrise at your

August 1999

SUN	MON	TUE	WED	THU	FRI	SAT
1 G-F	2 F	3 F-P	4 P	5 P	6 P-F	7 F
8 F	9 F-G	10 G	11 G-F	12 F	13 F	14 F
15 F	16 F	17 F	18 F-P	19 P	20 P-VP	21 VP-P
22 P-F	23 F	24 F-G	25 G	26 G	27 G	28 G-F
29 F	30 F	31 F-G				

location, and again during the afternoon. Short skip beyond about 700 miles will occur during daytime hours.

30-40 meters

Good worldwide DX openings from sunset to sunrise should occur on (G) days. Noise levels (static) will be higher if thunderstorms occur, and can depress audibility. Short skip

between 100 and 1000 miles will occur during daylight hours, and at distances beyond 1000 miles at night.

80-160 meters

On 80, DX to the southern hemisphere and to Europe should occur after dark and during sunrise hours—limited, of course, by static noise levels. Daytime short skip to about 350

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA								20	20			
ARGENTINA	10/15	20	20	20	20						10/15	10/15
AUSTRALIA	15	15	15/20	15/20	40/80	40/80	20					15
CANAL ZONE	15	20	20	20	40	40	20	20	20		10	15
ENGLAND	20	20	20		40						20	20
HAWAII	15	15	15/20	20	40/80	40/80						15
INDIA	20	20										
JAPAN							20	20				
MEXICO	15	20	20	20	40/80	40/80	20	20	20		10	15
PHILIPPINES	15	15	15/20	15/20	40/80	40/80	20					
PUERTO RICO	15	20	20	20	40	40	20	20	20		10	15
RUSSIA (C.I.S.)	20	20										20
SOUTH AFRICA		40/80	40/80	20	20	20	20				20	20
WEST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		

CENTRAL UNITED STATES TO:

ALASKA							40/20	20				
ARGENTINA	15/20	20/40	20/40								15	15/20
AUSTRALIA	15			20	20/40	20/40	20/40					15
CANAL ZONE	20	20	20	40/80	40/80		20	20	15	15	10	10
ENGLAND	20	20	20/30	40	40		20	20				20
HAWAII	15	15	20	20	20/40	40	40	20	20			15
INDIA			20	20								
JAPAN						40/80	40/80	20	20			
MEXICO	20	20	20	40/80	40/80		20	20	15	15	10	10
PHILIPPINES	15			20	20/40	20/40	20/40					15
PUERTO RICO	20	20	20	40/80	40/80		20	20	15	15	10	10
RUSSIA (C.I.S.)	20	20	20					20				20
SOUTH AFRICA				20/40	20/40	20						

WESTERN UNITED STATES TO:

ALASKA						20	20	40/80	20	20		
ARGENTINA	15/20	15/20	20	20	40	40						15
AUSTRALIA	15	15	15	20	20			40/80	20/40	20		
CANAL ZONE	10/15	15/20	15/20	20/40	40	40		20	20			10
ENGLAND	20	20										
HAWAII	15	15	15	20	20/40	20/40	40		20	20		
INDIA								20	20			
JAPAN				20	20	40/80	40/80		20	20		
MEXICO	10/15	15/20	15/20	20/40	40	40		20	20			10
PHILIPPINES	15	15	15	20	20			40/80	20/40	20		
PUERTO RICO	10/15	15/20	15/20	20/40	40	40		20	20			10
RUSSIA (C.I.S.)	20	20	20					20	20			20
SOUTH AFRICA				20	20							
EAST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		

Table 1. August Band-Time-Country chart.

September 1999

SUN	MON	TUE	WED	THU	FRI	SAT
			1 F	2 F	3 F-G	4 G
5 G	6 G	7 G	8 G-F	9 F	10 F	11 F-G
12 G	13 G	14 G-F	15 F-G	16 G	17 G	18 G
19 G-F	20 F-P	21 F-P	22 P-F	23 F	24 F-P	25 P
26 P-VP	27 VP	28 VP-P	29 VP-P	30 P		

miles, and beyond 500 miles after dark, will prevail on (G) days. On 160, no daytime propagation will occur due to ionospheric absorption of signals, but after dark, peaking around midnight and again during the predawn hours, you should be able to work many areas of the world. Short skip from 1000-2000 miles or so will prevail during the nighttime hours ... but, as always,

it will be limited by high static levels from thunderstorm activity.

Don't forget to work the *darkness path* (± 30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
ARGENTINA	20/30	20/30	40	40	-	-	-	-	-	10/12	10/12	15/17
AUSTRALIA	15/17	-	20/30	20/30	-	-	40	20/30	20/30	-	-	15/17
CANAL ZONE	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
ENGLAND	40	40	40*	40*	40	-	20/30	15/17	10/12	10/12	20/30	20/30
HAWAII	15/17	20/30	20/30	40	40	40	20/30	20/30	-	-	10/12	10/12
INDIA	-	-	-	-	-	-	20/30	20/30	-	-	-	-
JAPAN	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
MEXICO	15/17	20/30	40*	40*	40	-	20/30	20/30	10/12	10/12	15/17	-
PHILIPPINES	-	-	-	-	-	-	20/30	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	40*	40*	40	-	20/30	20/30	10/12	10/12	15/17	-
RUSSIA (C.I.S.)	40	40	-	-	-	-	-	15/17	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	15/17	15/17	10/12	20/30	-
WEST COAST	40	80	-	-	-	-	20/30	20/30	20/30	15/17	40	-

CENTRAL UNITED STATES TO:

ALASKA	15/17	-	-	-	-	-	-	-	-	-	-	15/17
ARGENTINA	15/17	20/30	20/30	40	40	-	-	-	-	-	10/12	15/17
AUSTRALIA	15/17	20/30	20/30	20/30	-	40	80	-	-	-	-	15/17
CANAL ZONE	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
ENGLAND	-	40/80	40/80	-	-	15/20	15/17	15/17	20/30	20/30	20/30	-
HAWAII	15/17	20/30	20/30	40	40	40*	80	20/30	-	-	10/12	15/17
INDIA	-	-	-	-	-	-	-	20/30	-	-	-	-
JAPAN	15/17	-	-	-	-	-	-	-	-	-	-	15/17
MEXICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
PHILIPPINES	15/17	20/30	-	-	-	-	-	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	20/30	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	-	15/17	15/17	20/30

WESTERN UNITED STATES TO:

ALASKA	10/15	15/17	15/17	20/30	20/30	20/30	40	40	-	-	-	15/17
ARGENTINA	10/15	20/30	20/30	40	-	-	-	-	-	-	-	15/17
AUSTRALIA	10/12	15/17	15/17	20/30	20/30	40	40	40	20/30	20/30	15/20	15/17
CANAL ZONE	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
ENGLAND	-	-	-	-	-	-	-	-	-	15/20	15/20	-
HAWAII	10/12	15/17	20/15	40	40*	40*	40	40	-	20/30	20/30	20/30
INDIA	15/20	15/20	-	-	-	-	-	-	20	-	-	-
JAPAN	10/15	15/17	15/17	20/30	20/30	20/30	40	40	-	-	-	15/17
MEXICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
PHILIPPINES	15/20	15/20	-	20/30	-	40	40	-	20/30	20/30	-	15/17
PUERTO RICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	-	20/30	-	-	-
SOUTH AFRICA	20/30	20/30	-	-	-	-	-	-	-	15/17	15/17	20/15
EAST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40

Table 2. September Band-Time-Country chart.

LETTERS

From the Ham Shack

Anonymous, Madison WI.

During the buildup to the great gasoline war of 1990, I was in a KC-135 aerial tanker unit delivering fighters deploying through the Mediterranean Sea to the Middle East. We would pick them up around Gibraltar, refuel them en route, and drop them off around the Red Sea. Then we would turn around and come back.

In that area of the world, I kind of liked our other pals to be up on an HF frequency in case we got separated, but we wanted some privacy, too. All the HF refueling frequencies are monitored by everyone around the world, so they were out. I finally hit upon the idea of camping out on an 11-meter CB frequency (channel 19, to be exact), figuring that even the nosiest spy or satellite on their side *or* our side wouldn't be hardy enough to listen to that frequency for long without going buggy.

It worked. We got HF contact when needed and could babble, alter plans, and screw off to our heart's content, secure in the knowledge that the truckers of America had the frequency jammed tight against those prying rascals on both sides. 10-4!?

Ken Meyer K9KJM, Sturgeon Bay WI. Enclosed is a picture of my ever growing antenna farm.

Pictured is the 65-ft. tower next to the radio "shack" with M2 440-18 UHF vertical, M2 2M12 horizontal 2 meter, M2

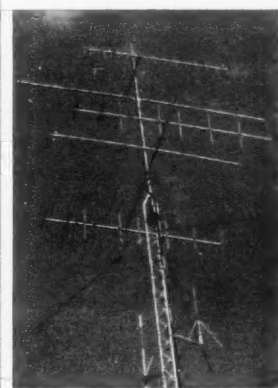
440-21 horizontal, and a pair of homemade 8-element "Quagi" 2 meter vertical antennas. Side-mounted on the tower is an ICOM AH 7000 and Channel Master scanner antennas.

Under construction at this time is a new 80-ft. tower 150 feet north of the pictured tower, and a 50-ft. tower 150 feet south of it. These towers will be for HF use.

Not pictured is a 40-ft. "windmill" tower 85 feet east of the pictured tower, and a 55-ft. tower 100 feet west of it.

Both are used to hold up HF dipole antennas, 2 meter packet omni antennas, and an HF vertical.

While I do not have the small lot size restrictions, I do have problems with trees. Every new wire antenna means cutting down a few trees, mostly pine, but the trees do not go to waste. The large ones are taken to a sawmill and cut into boards that I can hopefully use to add on to the ham shack.



before any one else hears him, and you can snag a good catch.

Please note that on this month's Band-Time-Country

chart, (*) indicates a possible 80 meter opening, and (-) indicates a difficult path. Good hunting! WIXU/7.

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the November 1999 classified ad section is September 10, 1999.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at [\[www.ohio.net/~rtormet/index.htm\]](http://www.ohio.net/~rtormet/index.htm)—over 100 pages of circuits, tables, RF design information, sources, etc.

BNB530

DFJr direction finder and MicroPLL programmable transmitter (formerly Agrelo) are now back under new management! Check exciting new accessories and upgrades. Order online at [\[www.swssec.com\]](http://www.swssec.com) or call SWS Security at (410) 879-4035 (9-5 ET).

BNB220

RF TRANSISTORS TUBES
2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, 6KG6A, etc. **WESTGATE**, 1-800-213-4563.

BNB6000

Cash for Collins: Buy any Collins Equipment. **Leo KJ6HI**. Tel./FAX (310) 670-6969. [\[radioleo@earthlink.net\]](mailto:radioleo@earthlink.net).

BNB425

MAHLON LOOMIS, INVENTOR OF RADIO, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send \$25.00 donation with \$5.00 for S&H.

BNB420

METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS **Johan N3RF**. Send \$1.00 & SASE. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA.

BNB421

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [\[www.ohio.net/~rtormet/index.htm\]](http://www.ohio.net/~rtormet/index.htm) or send check or M.O. for \$19.95 + \$2.00 P&H to RMT Engineering, 6863 Buffham Rd., Seville OH 44273.

BNB202

QSL CARDS. Basic Styles; Black and White and Color Picture Cards; Custom Printed. Send 2 stamps for samples and literature. **RAUM'S**, 8617 Orchard Rd., Coopersburg PA 18036. Phone or FAX (215) 679-7238.

BNB519

WANTED: High capacity 12 volt solar panels for repeater. [\[kk4ww@fairs.org\]](mailto:kk4ww@fairs.org) or (540) 763-2321.

BNB2630

COLLOIDAL SILVER GENERATOR! Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, \$74.50. Same, but DC powered, \$54.50. Add \$2.50 shipping. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374.

BNB342

ASTRON power supply, brand-new w/warranty, RS20M \$99, RS35M \$145, RS50M \$209, RS70M \$249. **AVT.** Call for other models. **(626) 286-0118.**

BNB411

Wanted: ICOM UX-R96 and UX97 plug-in modules for an ICOM 970. **Randy Ballard N5WV**, (903) 687-3002.

BNB175

HEATHKIT COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copy-right manuals. **Phone:** (616) 925-5899, 8-4 ET.

BNB964

Electricity, Magnetism, Gravity, The Big Bang. New explanation of basic forces of nature in this 91-page book covering early scientific theories and exploring latest controversial conclusions on their relationship to a unified field theory. To order, send check or money order for \$16.95 to: American Science Innovations, PO Box 155, Clarington OH 43915. Web site for other products [\[http://www.asi.2000.com\]](http://www.asi.2000.com).

BNB100

Sell: IC 765. \$1200.00 Never transmitted on, tuned by ICOM in '98. Org. Box and instr. book. Org. Bill of Sale. (707) 665-9171 Cal. KE6EFE.

BNB156

COLD FUSION! - FUEL CELL! - ELECTRIC BICYCLE! Each educational kit: (Basic - \$99.95, Deluxe - \$199.95, Information - \$9.95.) CATALOG - \$5.00. **ELECTRIC AUTOMOBILE BOOK** - \$19.95. **KAYLOR-KIT**, POB 1550ST, Boulder Creek, CA 95006-1550. (631) 338-2300.

BNB128

Wanted: ICOM IC-970. Must be in mint condition, non smoker. Also looking for the following ICOM sales brochures: IC-275, 575, 375 and 970. **Randy Ballard N5WV**, (903) 687-3002.

BNB75

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. \$12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [\[http://wltip.com\]](http://wltip.com).

BNB113

NEVER SAY DIE

continued from page 59

normal, is growing several hundred black walnut trees, which are worth about \$100,000 apiece at maturity. I'll have to call him and ask if he's thought of also growing black winter truffles under his trees.

Black truffles are extremely fragrant fungi which grow at the roots of oak, nut, and willow trees in Spain, Italy, and the south of France. Truffles can sell for as much as \$800 a pound, so they're a great cash crop, and at least one entrepreneur who has a filbert farm is planning on growing 'em here in America.

In Europe, they use pigs to find the truffles, but they have a tendency to eat 'em, if not watched very carefully. Better, is a trained cocker spaniel. There's a chap in New Jersey who's trained his dog to find truffles by using bits of hot dog soaked in truffle juice buried around his yard.

Of course, if you live in a city you won't have a lot of oak, nut, or willow trees around—and you may not survive Y2K anyway, so never mind. But then I keep pushing you to start your own business so you can get the

hell out of the city and not waste so much time on commuting.

Imprimis

This is a free publication from Hillsdale College which often has some very interesting reprints of talks given at the college. Drop 'em a request at Hillsdale College, Hillsdale MI 49242.

In their November issue they had a piece about the National Foundation for Teaching Entrepreneurship (NFTE), which has been teaching kids, primarily from poor families, how to start and run their own businesses. The government has blown \$1.5 trillion on the lost War on Poverty. Handouts are no answer to poverty, work is. The NFTE has produced 21,000 graduates so far, and a third of them are still running their own businesses! 95% of their graduates want to start their own businesses, as compared with 50% of the public.

Well, I've been preaching entrepreneurialism most of my life. I see it as the best way to achieve freedom, to have the potential for making plenty of money, and to end miseries such as commuting to work and the fear of being downsized, laid off, or having your job moved to Mexico. **73**

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronauts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-

come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before March 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? \$5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. \$5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (L)

Travel Diaries: You can travel amazingly inexpensively - once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (T)

Wayne's Caribbean Adventures: More budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. \$5 (U)

Radio Bookshop

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. \$15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (Z)

Reprints of My Editorials from 73.

Grist I: 50 of my best non-ham oriented editorials from before 1997. \$5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. \$5 (G)

1997 Editorials: 240 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three \$5 volumes. \$15 (O)

1999 Jan-Aug Editorials: 188 pages in two \$5 volumes. Bringing you up to date. \$10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. \$5 (Q)

\$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. \$43 (V)

One Hour CW: Using this sneaky method even you can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. \$5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctua-

tion you need to know if you are going on to learn the code at 13 wpm or 20 wpm. \$5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. \$5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. \$5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months. \$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. \$5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. \$5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. \$30 for six issues. (EE). A sample issue is \$10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (K)

.....Wayne

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Items ordered - use letters or copy page and mark books wanted. Order total plus \$3 s/h in US/\$6 Can.

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Foreign orders: \$10 s/h surface shipping. Lord knows what airmail will cost - make a good guess. Allow 4 weeks for delivery except foreign, though we try to get most orders shipped in a day or two.

MC/Visa for orders over \$10. # _____ Expire _____

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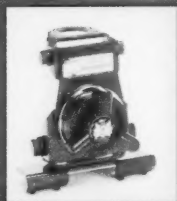
Yes! Put me down for a year of 73 for only \$25 (a steal). Canada US\$32.

Foreign US\$44 by sea, US\$67 by air. Whew!

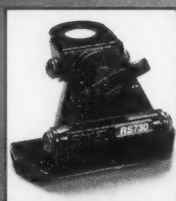
Go Mobile, get there with

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Lip Mounts



RS-720 NMO Multi-adjustable lip mount, up to 60" antenna. RS-720 NMO accepts an NMO mount.



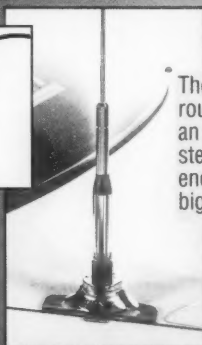
RS-730 Multi-adjustable heavy duty lip mount, up to 70" antenna.



RS-520 Multi-adjustable lip mount, up to 45" antenna.



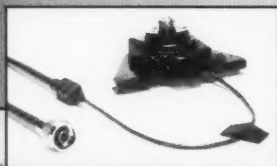
GR-5M Deluxe trunk lip mount. Rubber coated base protects the vehicles paint. All stainless steel, includes the CK-3M5 deluxe cable assembly to avoid water leaks/cable damage when shutting the trunk. Four large set screws hold it securely in place. Two offset washers adjust the antenna to vertical. Gold-plated SO-239/PL-259 connectors.



The **GR-5M's** smooth rounded corners make an attractive stainless steel mount strong enough to hold the biggest antennas.



B



CQ-5M "Quick-disconnect" trunk lip mount. Rubber coated-base protects the vehicles paint. Includes the CK-3M5 deluxe cable assembly avoiding water leaks or cable damage when shutting the trunk. Gold-plated SO-239/PL-259 connectors.



C

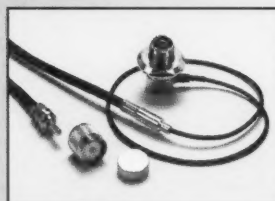
COMET's newest and most unique truck lip mount, the **CQ-5M**. Mounts to any trunk lid and adjusts to vertical with two offset washers. The mount base supports even the largest dualband or HF antenna.

A) CQ-5M trunk lip mount with **COMET** SBB-2 2M/70cm antenna.

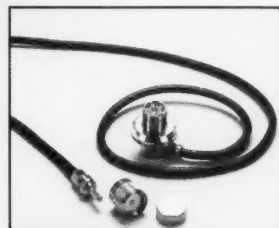
B) Quick-disconnect lever releases the antenna and connector for long term storage in your trunk, to use a car wash, or theft prevention.

C) The low profile base is the only thing that remains when the antenna is removed, ready for instant re-attachment.

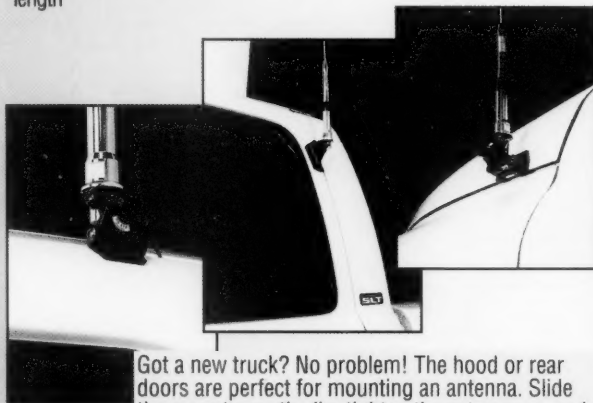
Cable Assemblies for Lip Mounts



CK-3M5 Deluxe cable assembly 17' length including 17" of RG-188A/U for easy entry from a lip mount without causing water leak, wind noise or coax damage. **CK-3M** Deluxe cable assembly same as CK-3M5, but 9'9" total length.

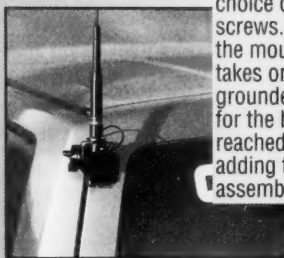


3D5M Standard low loss cable assembly. Gold plated SO-239/PL-259 connectors. 17' length. **3D4M** Same as 3D5M, but 13.5' length.



Got a new truck? No problem! The hood or rear doors are perfect for mounting an antenna. Slide the mount over the lip, tighten the set screws, and adjust it to vertical. No holes to drill, the mount is grounded and installation takes only a few minutes. Choose the deluxe or standard cable assembly in the length required.

Going mobile is easy with **COMET** products, and there are no holes to drill. The rear doors on VAN's and SUV's are the perfect place to mount an antenna. Simply lift or open the rear door, slide your mount of choice over the lip, then tighten the set screws. Soft rubber protects the paint, and the mount adjusts to vertical. Installation takes only a few minutes. The mount is grounded, the antenna is above the roof line for the best performance and is still easily reached if needed. Complete the system by adding the standard or deluxe cable assembly in the appropriate length.



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NEW MH-209SMA • Dual-band 146/446MHz HT Antenna w/SMA Conn
Gain & Wave: 0 1/4 wave • Length: 3' • Flexible rubber • Conn: Male SMA • Max Pwr: 5W

NEW SMA-503 • Dual-band 146/446MHz HT Antenna w/SMA Conn
Length: 8.75' • Conn: Male SMA • Max Pwr: 10W

NEW MH-510 • Tri-band 52/146/446MHz HT Antenna w/SMA Conn
Gain: 0/0 3.2dBi • Length: 20.75' • Conn: Male SMA • Max Pwr: 10W

SB-15 • Tri-band 52/146/446MHz w/fold-over
Gain & Wave: 52MHz 0dBi 1/4 wave • 146MHz 4.5 dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

NEW BLACK COLOR

SBB-7 SBB-7NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: SBB-7 PL-259/SBB-7NMO NMO • Max Pwr: 70W

NEW BLACK COLOR

SBB-5 SBB-5NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.5dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO • Max Pwr: 120W

THFT Z750 • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: Gold-plated PL-259 • Max Pwr: 200W

THFT Z780 • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
146MHz 6/8 wave 4.5dBi • 446MHz 5/8 wave x 3 7.2dBi • Length: 62" • Conn: Gold-plated PL-259 • Max Pwr: 150W

B-20 B-20NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.0dBi 5/8 wave x 2 • Length: 30" • Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W

B-10 B-10NMO • Dual-band 146/446MHz cellular look-a-like •
Gain & Wave: 146MHz 0dBi 1/4 wave • 446MHz 2.15dBi 1/2 wave • Length: 12" • Conn: B-10 PL-259/B-10NMO NMO • Max Pwr: 50W

- The CA-UHV is a 6M/2M/70cm tri-band antenna. Add 2-3 of the stock or optional coils for 5-6 band operation.
- HF-70cm all in one economical easy to mount antenna.
- Fold-over hinge built in.
- Select the correct duplexer or triplexer for your specific radio (s).
- CF-706A, CF-530, CFX-514N (Ask your dealer)

NEW CA-UHV • HF/6M/2M/70cm Mobile Antenna 40"/20"/17 1/2"/15 1/2"/10 1/2"/6 1/2"/2M/70cm

Gain & Wave: HF-6M 1/4 wave • 2M 3.4dBi 5/8 wave • 70cm 2.15dBi 1/2 wave • VSWR: HF 1.6:1 or less • 6M-70cm 1.5:1 or less • Length: 62" • Max Pwr: HF 120W SSB • 6M 200W SSB/100W FM • 2M/70cm 100W FM • *L-14 Optional 20M coil • *L-18 Optional 17M coil

NEW M130-10000 • Dual-band 146/446MHz w/spring whip and fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: PL-259 • Max Pwr: 120W

NEW M130-31000 • Dual-band 146/446MHz w/spring whip and fold-over
Gain & Wave: 146MHz 3.5dBi 1/2 wave • 446MHz 6.0dBi 5/8 wave x 2 • Length: 43" • Conn: PL-259 • Max Pwr: 150W

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- Frequency Tuning
- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

PC not included

The Kachina 505DSP Computer Controlled HF Transceiver After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

Why Use Knobs if You Have Windows? The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-

the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

16/24 Bit DSP/DDS Performance In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDS performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an

excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add *lots* of punch to your transmitted signal without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

Seeing is Believing American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at <http://www.kachina-az.com> for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

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